# Comments Received: Clean Heat Standard
# September 2, 2023 – February 9, 2024

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December 21, 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 Draft Program Framework and Draft Regulatory Language**

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) Draft Program Framework and Draft Regulatory language. . A Better City appreciates the Healey-Driscoll Administration's commitment to ensuring that Massachusetts meets or exceeds its ambitious climate goals.

Our comments on the Clean Heat Standard Draft Framework and Regulatory Discussion Document cover the topics of: 1) considering combined heat and power as transitional clean energy for credit generation; 2) establishing best practice guidelines for transparent and robust verification of CHS credits; 3) ensuring alignment across the clean heat and emissions tracking system (CHETS) and parallel efforts to track emissions in Massachusetts; 4) clarifying the role of district energy projects in CHS credit generation; 5) clarifying how the CHS will interact with the MA Department of Public Utilities' gas utility 20-80 order; and 6) creating a dedicated fund with clear guidelines and transparent reporting on disbursements for CHS alternative compliance payments (ACPs).

**1) Considering Combined Heat and Power (CHP) and Hydrogen as Transitional Clean Energy for Credit Generation**

A Better City members would like to reiterate our comment made in a previous comment letter requesting consideration of CHP as a transitional clean energy for credit generation. This consideration will depend 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 would also like to request consideration of hydrogen as a transitional clean energy for credit generation. The current framework limits energy crediting to electricity and liquid biofuels at the program's startup, with a scheduled 2028 program review to evaluate revising eligibility based on specific criteria. However, there are many hard to decarbonize large buildings where transitional fuels like hydrogen can play an important role. Hydrogen can potentially run CHP plants, for example, providing both thermal and grid support as we transition to a renewable energy future. Additionally, hydrogen could play a role in the transportation sector as well.

***Recommendation: A Better City recommends considering CHP and hydrogen as transitional clean energy for credit generation in initial years of CHS implementation for hard-to-decarbonize buildings and transportation.***

**2) Establishing Best Practice Guidelines for Transparent and Robust Verification of CHS Credits**

To ensure the credibility, accuracy, and transparent verification of CHS credits, it will be vital for the MassDEP to publish best practice guidelines for robust, transparent, third-party verification of CHS credit projects in the regulatory language itself, and to consider publishing a list of pre-vetted third-party verifiers capable of accrediting and verifying CHS projects in Massachusetts. It will be especially helpful to establish such best practice guidelines in the voluntary phase of CHS implementation, prior to mandatory compliance to come. As A Better City suggests in our report on carbon removals best practices and recommendations for a PAVER+ framework for carbon removals, similar best practice guidelines for CHS credits will help to maintain credibility, transparency, and accuracy in the CHS verification process, and will ensure that credits are delivering on the impacts intended. Particularly in the case of CHS credit banking and potential trading of credits to come, it will be essential to prevent double counting, leakage, and other unintended consequences that could undermine the CHS program.

***Recommendation: A Better City recommends establishing best practice guidelines for CHS credit verification, including recommendations for equity credit verification, and considering publishing a list of qualified third-party verifiers for CHS projects in Massachusetts. A Better City recommends clarifying best practices for verification in the regulatory language itself in the voluntary phase of CHS credit generation, prior to mandatory compliance to come.***

**3) Ensuring Alignment Across the Clean Heat and Emissions Tracking System (CHETS) and Parallel Efforts to Track Emissions in Massachusetts**

A Better City appreciates the establishment of a Clean Heat and Emissions Tracking System (CHETS) and suggests ensuring that the CHETS be published online in a publicly accessible place. Further, in addition to the programs listed under "complementary programs" it will be important for the CHETS to be aligned and coordinated with parallel efforts to track greenhouse gas emissions reductions in Massachusetts, including but not limited to: the state building decarbonization dashboard, the anticipated energy and emissions data from large existing buildings established by the 2022 climate bill, efforts to track emissions within the newly created Office of Climate Science, and more. Additionally, it would be helpful for MassDEP to consider how to leverage municipal building data from programs like BERDO 2.0 in Boston, which have rigorous systems for tracking emissions reductions in large existing buildings.

***Recommendation: A Better City recommends affirming that the CHETS data will be made publicly available online for transparency and will be coordinated and aligned with parallel efforts to track building emissions in Massachusetts beyond those listed in "complementary programs." A Better City recommends considering alignment across the CHETS, emissions tracking in large existing buildings as per the 2022 climate bill, as well as leveraging municipal-level decarbonization data from programs like BERDO 2.0 in Boston.***

**4) Clarifying the Role of District Energy Projects in CHS Credit Generation**

A Better City would appreciate clarity in the draft regulatory language regarding how the CHS may consider credits from district energy projects like networked geothermal energy projects, which will likely become more and more common as Massachusetts implements its climate and clean energy goals. A recent example is the networked geothermal pilots currently being pursued by utilities in areas like Framingham.

***Recommendation: A Better City recommends including language in the draft regulations that clarifies the role of district energy projects in CHS credit generation. .***

**5) Clarifying How the CHS will Interact with the MA Department of Public Utilities' (DPU) Gas Utility 20-80 Order from December 6, 2023**

There is currently confusion about how the CHS will interact with the December 2023 decision from the DPU Gas Utility 20-80 Order, which will also help the state transition away from natural gas. As the CHS and DPU are both working towards a similar goal of minimizing greenhouse gas emissions in Massachusetts, it would be helpful to clarify how the MassDEP and DPU plan to work together to implement these parallel, yet overlapping, programs.

***Recommendation: A Better City recommends clarifying how the MassDEP and DPU will work together to implement the parallel, and overlapping, policies of the CHS and DPU Gas Utility 20-80 Order.***

**6) Creating a Dedicated Fund with Clear Guidelines and Transparent Reporting on Disbursements for CHS Alternative Compliance Payments (ACPs)**

A Better City strongly suggests establishing a dedicated Fund for anticipated ACPs for the CHS, to ensure that such proceeds do not revert to the General Fund and are in fact dedicated "toward contracting for additional clean heat in future years" as stated in the draft regulatory language. Such a Fund could annually publish disbursements in a publicly available place online, to ensure transparency and accountability for the use of ACP funds by MassDEP.

***Recommendation: A Better City recommends establishing a dedicated Fund for anticipated alternative compliance payments from the CHS and requiring the Fund to annually publish disbursement data in a publicly available place online to ensure transparency and accountability.***

We 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

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December 21, 2024

*via email*

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Re: Stakeholder input to inform the development of a Clean Heat Standard (CHS) program

Dear Commissioner Heiple:

Acadia Center appreciates the opportunity to provide feedback on the CHS Draft Framework (Framework) provided by the Massachusetts Department of Environmental Protection (DEP) for a Clean Heat Standard. Decarbonizing the building sector equitably will be critical to achieving our Commonwealth's Net Zero Emissions requirements, and this proposal represents an essential step forward. Acadia Center applauds DEP for its bold vision and for recognizing that the challenges posed by this transition are incredibly complex. In particular, the exclusion of RNG and hydrogen from qualifying under this Framework demonstrates that the DEP has a strong grasp of the stakes involved.

However, given the complexity of the proposed Framework and the potential widespread implications of such a policy, it was challenging to fully evaluate the Framework given the relatively short time between the Framework being distributed to stakeholders and the December 21st comment deadline. These comments therefore represent *initial thoughts* from Acadia Center on a wide range of topics related to CHS design. We look forward working with DEP and diving in more deeply to analyzing the potential impacts of the CHS in early 2024.

## Overview of Initial Comments

In the following sections, Acadia Center provides initial commentary and recommendations pertaining to: Stakeholder Process; Alternative Fuels; Credit Generation Quantification Approach; and Overarching Policy Design Recommendations. Acadia Center has also worked closely to coordinate with and contribute to a set of joint comments from environmental stakeholders, entitled "Joint Comments by Climate Advocates." We express our support as a signatory to those comments, and take the opportunity to further elaborate on issues and recommendations in these standalone comments, which solely reflect the input of Acadia Center.

## Stakeholder Process:

### More Detailed Quantitative Analysis Underlying Policy Design Decisions is Necessary for Fulsome Review

Given the highly complex nature of CHS policy design and the importance of underlying quantitative inputs and analysis that is undoubtedly influencing policy design, it would be greatly beneficial to share as much of that analysis with stakeholders as possible. This will enable stakeholders to understand and analyze the policy design and potential impacts of the policy design, which will, in turn, increase the quality and technical rigor of constructive feedback provided by stakeholders. Based on information communicated to stakeholders on the December 7, 2023 webinar, it appears that DEP is making a commitment to sharing more of the underlying quantitative analysis going forward, which Acadia Center supports and appreciates. Acadia Center highlights a number of topic areas in the comments below where additional quantitative analysis by DEP would be highly valuable to the ongoing CHS design process.

## Alternative Fuels:

### It is Essential That Gaseous Biofuels and Hydrogen Remain Ineligible

DEP's proposal to make gaseous biofuels (e.g., "renewable natural gas") and hydrogen ineligible under the Framework is wholeheartedly supported by Acadia Center. The ineligibility of gaseous biofuels and hydrogen under the CHS is absolutely essential for keeping the Commonwealth on the most cost-effective trajectory towards building decarbonization, as the findings from the both 2025/2030 Clean Energy and Climate Plan (CECP), 2050 CECP, and the recent Order (20-80-B) from the Department of Public Utilities (DPU) in docket 20-80 have highlighted. The Commonwealth must begin to grapple with strategic, geographically targeted decommissioning of the natural gas system, and the proposal to make gaseous biofuels and hydrogen ineligible under the CHS, combined with DPU 20-80-B, sends this message loud and clear.

Making gaseous biofuels or hydrogen eligible under the CHS would be in direct conflict with DPU 20-80-B and send a confusing, mixed signal to the local distribution companies (LDCs). Acadia Center shares the view of the DPU that the costs, limited availability, and highly questionable GHG emissions reduction benefits of RNG make it an unsuitable building decarbonization strategy for the state. Below are select quotes from DPU 20-80-B regarding RNG and hydrogen:

- "The Department rejects the recommendation to change its current gas supply procurement policy to support the addition of renewable natural gas ("RNG") to LDC supply portfolios due to concerns regarding the costs and availability of RNG as well as its uncertain status as zero-emissions fuel."[1]

- "At this time, as we discuss below, we have been presented with no evidence convincing us to alter this gas procurement policy. On the contrary, we share the concerns raised by various stakeholders regarding costs, availability, and the treatment of renewable fuels as carbon neutral."[2]

- "The Department cautions, however, that RNG and hydrogen may require system upgrades due to the density of the fuels. If the LDCs need to upgrade their systems or incur additional interconnection and metering equipment costs to make these fuels available, all of the relevant system-upgrade costs, in addition to traditional costs borne by gas ratepayers, must be assumed by those who will take RNG supply and not by all customers."[3]

- "… we agree with the Attorney General that RNG and hydrogen blending are new, unproven, and uncertain technologies."[4]

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[1] DPU Order 20-80-B, at 1.

[2] *Id.*, at 67.

[3] *Id.*, at 71.

[4] *Id.*

- "Further, hydrogen and RNG demonstration project proposals must thoroughly explain how the targeted application is "hard to decarbonize," in addition to explaining electrification alternatives and alignment with the GWSA and the 2021 Climate Act."[5]

On the topic of the future of the gas distribution system, DPU went on to add:

- "As the Commonwealth strives to achieve its 2050 climate targets, we envision that the long-term use of the natural gas distribution system generally will be limited to strategic circumstances where electrification is not feasible for all natural gas applications. For example, we recognize that some C&I customers require natural gas for process heat applications for which there are currently no electric-driven alternatives."[6]

- "As we discuss in Section VI.D, however, the Department is not persuaded that pursuit of a broad hybrid heating strategy that would necessitate maintenance of the natural gas system to support backup heating systems is a viable path forward."[7]

To summarize, DPU: 1) Does not support blending of RNG or hydrogen into the gas distribution system; 2) Does not see hybrid heating via the natural gas system as a viable building decarbonization strategy; and 3) Finds that the long-term role of the gas system is providing fuel needed for niche commercial and industrial process heat applications. The only logical conclusion based on this information is that the Commonwealth needs to begin geographically targeted, strategic decommissioning of the natural gas system in order to achieve its climate targets.

Given the stances expressed by DPU on RNG, hydrogen, and the future role of the gas distribution system, Acadia Center does not see any justifiable reason why the CHS would make RNG or hydrogen eligible clean heat measures, now or at any future point in a CHS program. We applaud DEP for its initial proposal on this set of issues and urges that future program designs maintain and strengthen their stance in this regard.

On a related note, DEP specifically asked for stakeholder comments on criteria for "evaluating other actions for crediting." The three proposed criteria are all supported by Acadia Center: 1) Lifecycle GHG emissions of fuels, 2) Availability of fuels, and 3) Local air pollution impacts.

**Acadia Center would suggest a fourth evaluation criterion, 'Consistency with Infrastructure Transition Strategy,' which would be defined as: Does crediting of this fuel under the CHS help to minimize the future risk of stranded assets in the gas distribution system, minimize the climate risk posed by the highly uncertain levels of methane leaks from the gas distribution system and gas end-uses, and broadly align with the state's vision for the long-term role of the gas distribution system, as expressed in the 2050 CECP and DPU Order 20-80-B?**

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[5] *Id.*, at 84.
[6] *Id.*, at 70.
[7] *Id.*, at 55.

## More Information Needed Regarding the Mechanics of How the Massachusetts Alternative Portfolio Defines and Verifies "Eligible Liquid Biofuels"

The Framework proposes that liquid biofuels eligible under the Massachusetts Alternative Portfolio Standard (APS) should be credited "based on the assumed avoidance of all emissions from combustion of an equivalent quantity of heating oil." Firstly, making the simple assumption that these biofuels represent a 100% reduction in emissions relative to combustion of heating oil is overly simplistic. DEP suggested one of the eligibility criteria for fuels under the CHP would be "Lifecycle analysis of greenhouse gas emissions associated with producing and utilizing the fuel, including the timeframe of the assessment." Given this proposed evaluation criterion, Acadia Center requests further information regarding the lifecycle analysis of "Eligible Liquid Biofuels" as defined under the APS to warrant the crediting of these fuels as a 100% reduction in GHG emissions. Without more evidence on this topic, Acadia cannot support crediting these fuels at the 100% level as DEP has proposed.

The APS defines "Eligible Liquid Biofuels" as "A liquid fuel that is derived from organic waste feedstocks. Organic waste feedstock shall include, but not be limited to, waste vegetable oils, waste animal fats, or grease trap waste."[8] While Acadia Center generally agrees with the principle of limiting liquid biofuel eligibility to liquid biofuels derived from "*true organic waste feedstocks,"* there are considerable real-world challenges to determining if a biofuel is actually derived from organic waste byproducts, compared to biomass primarily grown for the purpose or producing biofuels, commonly referred to as "energy crops." Acadia Center is currently researching the exact mechanics as to how the APS determines if liquid biofuels are actually derived from organic waste feedstocks and looks forward to commenting in more depth on this topic in early 2024.

The exact definition of "eligible liquid biofuels" under the APS and how that definition is enforced is a matter of *significant importance* if the CHS intends to adopt both the APS definition of eligible liquid biofuels and the process by which the APS confirms biofuels incentivized under the program comply with that definition. Acadia Center urges DEP to conduct more extensive research on the details of the APS definition and verification process and present this information to stakeholders, so stakeholders have the information needed to provide informed input on this critical topic. To date, this type of information has not been provided to stakeholders. Acadia Center will weigh in with our opinion on the exact levels these fuels should be credited at under the CHS once more information is provided.

## Any Liquid Biofuel That is Not Eligible Under the Massachusetts Alternative Portfolio Standard Should Not Be Eligible Under the CHS

While Acadia Center is currently withholding judgment, pending more information, of the CHS eligibility of "eligible liquid biofuels" as defined under the APS, we are *strongly opposed* to granting any CHS eligibility to liquid biofuels that *only meet* the less restrictive requirements of the federal Renewable Fuel Standard (RFS). In the Framework, DEP proposes that "Eligible waste-based liquid biofuels would be credited based on the assumed avoidance of all emissions from combustion of an equivalent quantity of heating oil. Other liquid biofuels eligible for the federal Renewable Fuel Standard would receive half credit through 2030 only." In other words, 1 gallon of RFS-eligible biofuels replacing 1 gallon of conventional heating oil would be assumed to reduce emissions associated with that fuel combustion by 50%.

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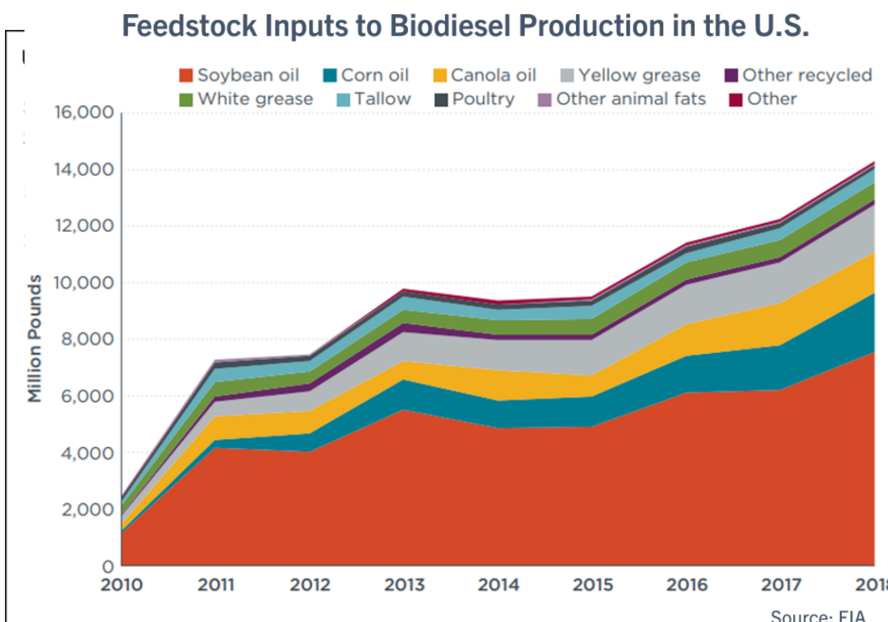
[8] https://www.mass.gov/doc/225-cmr-16-alternative-energy-portfolio-standard-aps/download

Firstly, DEP did not articulate which categories of RFS-eligible biofuels they are proposing to make eligible under the CHS. The RFS groups biofuels into four categories – conventional biofuels, advanced biofuels, biomass-based diesel, and cellulosic biofuels. "Conventional biofuels", as defined under the RFS, are particularly problematic. The RFS defines these fuels as "*Any fuel derived from starch feedstocks (e.g., corn and grain sorghum). Conventional biofuels produced in plants built after 2007 must demonstrate a* *20% reduction in life cycle GHG emissions.*"[9] While corn ethanol, a fuel that is not directly relevant in this conversation, represents the majority of "conventional biofuels" produced under the RFS, some production pathways for biodiesel and "renewable diesel" under the RFS only meet this "conventional biofuels" 20% reduction in life cycle GHG emissions thresholds. In 2023, about 1.6% of all biodiesel/renewable diesel production only met this 20% threshold.[10] If EPA only requires some biodiesel/renewable diesel production pathways to demonstrate a 20% reduction in life cycle GHG emissions, why would DEP propose crediting these same fuel-production pathways at a 50% emissions reduction level? Acadia Center requests more clarification on this specific point from DEP.




Notes: f = forecast. **Biofuel** includes biodiesel and renewable diesel.
Source: USDA, Economic Research Service using data from World Agricultural Outlook Board, *World Agricultural Supply and Demand Estimates*, November 2022.

The larger issue with the RFS eligibility criteria, is that the vast majority of biodiesel/renewable diesel produced in the U.S. (largely motivated by RFS incentives), rely on soybean oil or corn oil. In 2020, in the U.S., soybean oil accounted for 72% of all biodiesel production, while corn oil accounted for 13% of all production.[11] Additionally, about 42% of U.S. soybean oil production is used to produce biofuels, opposed to food, animal feed, or other industrial uses.[12] Why does this all matter? **Energy crops – including soy and corn – are extremely problematic for multiple reasons, including direct land use competition with food production and other potentially more efficient uses, and, in particular, the massive GHG emissions risk posed by indirect land use changes (ILUC).**

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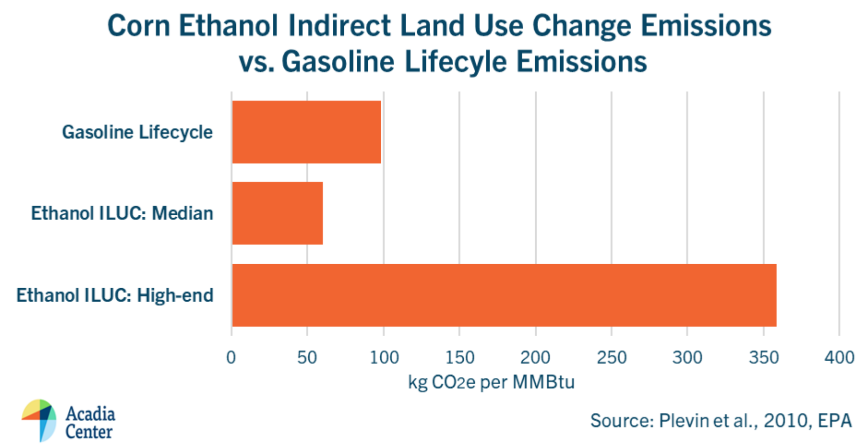
[9] https://afdc.energy.gov/laws/RFS
[10] https://www.epa.gov/fuels-registration-reporting-and-compliance-help/rins-generated-transactions
[11] https://www.eia.gov/biofuels/biodiesel/production/ Table 3
[12] https://www.ers.usda.gov/data-products/chart-gallery/gallery/chart-detail/?chartId=105520

ILUC are the unintended consequence of the expansion of croplands for biofuels to meet increased global demand for biofuels. The U.S. is one of the world's largest agricultural exporters and shifting land in the U.S. from agricultural food production to energy crop production can have ripple effects across the globe that cause significant GHG emissions. ILUC impacts are particularly concerning when the result is a conversion of tropical forests, which sequester a very large amount of carbon, to cropland. Trying to untangle, for instance, whether a farmer in the United States opting to grow corn to produce biofuels instead of a food crop indirectly causes a farmer in Brazil to clear-cut forested land to grow that same food crop is extraordinarily difficult, as demonstrated by multiple studies attempting to quantify this indirect effect.




The complexities of these ripple effects result in wide ranges of uncertainty when attempting to quantify emissions from ILUC. Much of the research on this topic is focused on corn ethanol, as it is the most widely produced biofuel in the U.S., but the same general principles apply to soy oil/corn oil biodiesel production pathways. As one example, ILUC emissions associated with US corn ethanol expansion during the 2000s in one widely cited study were estimated to fall in the range of 10.5 to 358.6 kg $CO_2$e per million Btu (MMBtu), with a median emission factor between 58.0 and 62.2 kg $CO_2$e per MMBtu.[13] To put those numbers in perspective, the median ethanol emission factor from that study is about 60% of the EPA's life cycle emission factor for conventional gasoline and **the high-end ethanol emission factor estimate is over 3.6 times higher than the emission factor for conventional gasoline.**[14] The U.S. Department of Energy's Billion-Ton Report – which is one of the most comprehensive studies calculating potential biomass supply in the United States and the associated environmental impacts – conducted analysis assessing the GHG impacts of scenarios with expanded biofuels production but did not attempt to quantify the GHG impacts of ILUC and highlighted the extreme uncertainty surround the topic.[15] **To summarize, there is a *high level of risk* that biofuels derived from energy crops have no GHG emissions reduction value.**

The extreme uncertainty around ILUC GHG impacts is one of the reasons why many policies aiming to accelerate the adoption of biofuels have excluded the use of biofuels derived from energy crops. For example, based on Acadia Center's current understanding of the APS, soybean oil-based biodiesel is explicitly excluded from Massachusetts' Alternative Energy Portfolio Standard.[16] Similarly, many net zero economy-wide modeling efforts have excluded energy crop expansion from consideration in GHG reduction pathways. **It is absolutely essential that the CHS not incentivize the production of biodiesel from energy crops due to the high level of risk posed by ILUC alone and**

[13] https://pubs.acs.org/doi/abs/10.1021/es101946t

[14] https://www.epa.gov/fuels-registration-reporting-and-compliance-help/lifecycle-greenhouse-gas-results

[15] https://www.energy.gov/eere/bioenergy/2016-billion-ton-report

[16] https://www.mass.gov/doc/ma-2050-decarbonization-roadmap/download, at 89

therefore, Acadia Center recommends that the CHS strictly limit biodiesel eligibility to fuels proven to not be derived from energy crops.

## Credit Generation Quantification Approach

### Emissions Avoided Credits Resulting from Full Electrification Projects Need Means of Verifying "Commitment to Limit Utilization of Remaining Combustion Equipment"

DEP is proposing the definition of a "full electrification" as 1) Installation of heat pumps capable of meeting 100% of space heating needs of a residence and 2) Removing all space heating combustion equipment or "commit to limiting utilization of remaining combustion equipment to backup or emergency use." DEP goes on to note that the "commitment approach is currently used under the Mass Save program."

The current Mass Save program approach that incentivizes whole-home heat pump installation, regardless of whether the "back up" combustion heating system is removed or left in place, is fundamentally flawed. If there are two identical homes receiving the exact same whole-home electrification incentive under the current Mass Save program, one could use their heat pumps to satisfy 0% of total winter space heating load and one could use their heat pumps to satisfy 100% of winter space heating load. There is simply no justification for incentivizing these two systems at the same level other than reduced administrative burden. However, this reduced administrative burden simply isn't worth the increased risk of these "full electrification" heating systems not being used as envisioned under the incentive design.

**The CHS represents a golden opportunity to improve upon the current Mass Save system by linking real-world heat pump usage data of an individual residence to the level of emissions clean heat checks (CHCs) generated by that project over the life of the system.** For example, for residential "full electrification" projects that leave a combustion heating system in place, looking at utility bill data for an individual housing unit and comparing the relative electricity consumption in historically low-use months (e.g. April, May, September, October) to consumption in months that are typically high-use fore electrically heated homes (e.g. January, February) would provide a relatively simple, low-administrative-burden means of approximating the extent to which the home relies on its electric heating system (opposed to the combustion "back-up" system) during the winter heating season. This low-month/high-month electric consumption ratio could be used to adjust the level of emissions CHCs generated by the "full electrification" project. DEP already seems to be proposing a similar approach with "hybrid electrification" projects (i.e., heat pump installations that don't meet 100% of building space heating load) by stating these projects would be "eligible for annual emission reduction credits based on evidence of utilization of heating, such as electricity billing records showing a winter-peaking pattern." It makes perfect sense to apply this same logic to "full electrification" projects that retain "back-up" combustions systems.

If DEP commits to the implementation of this type of verification mechanism, Acadia Center supports residential space heating electrification projects sized to meet 100% of load that also leave a "back-up" combustion system in place as being deemed "full electrification" projects under the CHS. However, without this mechanism in place, Acadia Center is strongly opposed to these projects being credited under the "full electrification" definition.

### Assumption that Each Residential "Full Electrification" Project Results in 5 MT CO2 Annual Emissions Avoided Under-incentivizes Residential Electrification Projects with Largest GHG Reduction Potential

DEP has proposed to credit residential "full electrification" projects at an emissions reduction level of 5 MT $CO_2$ per year, regardless of the size of the residence or whether the residence is an apartment or single-family home. DEP explains the logic for this proposal by stating, *"Larger residences normally emit more than 5 MT per year, but providing additional credit for electrifying larger residences would not be equitable because larger residences are normally owned by higher-income individuals."* **While Acadia Center agrees that equity considerations should be core to the design of the CHS, the other equity-enhancing policy mechanisms proposed by DEP – namely the low-income carve out and just transition fee (JTF) – are better policy vehicles for achieving the overarching equity goals of DEP.**

Both the up-front cost and emissions reduction benefits of electrifying homes varies considerably based on the square footage of the home. Acadia Center has significant concerns that full electrification projects undertaken to comply with CHS obligations would be too heavily skewed towards some of the smallest housing units in the state. This presents a significant risk of the emissions reduction standard undershooting the true level of emissions reduction needed in the residential building sector to comply with the subsector emissions limits, particularly in the early years of the CHS when there are significant levels of "low hanging, low square footage" housing stock that is financially attractive to obligated parties.

While Acadia Center acknowledges that larger residences are more likely to be owned by higher-income individuals, this is by no means a universal truth, and the 5 MT $CO_2$ annual emissions avoided for every housing unit assumption is a blunt instrument for addressing this concern. DEP has not provided any quantitative analysis providing more context on this topic – for example, what percent of the bottom 25% smallest square footage housing units in the Commonwealth are occupied by low-income residents? What percent of the top 25% largest square footage housing units are occupied by low-income residents? More quantitative analysis is needed to evaluate this policy design decision in any depth. This program design decision could have significant unintended consequences – for example, obligated parties targeting full electrification projects at 1,200 square foot luxury condos in, e.g., Back Bay owned by high-income individuals over 2,600 square foot single-family homes (in poor condition) owned by a multi-generational low-income family in, e.g., Fall River. In both cases, assuming the life of the heat pump system is 15 years, the value of emissions reduction CHCs generated by each project over the lifetime of the heating system would be: 15 years x 5 MT CO2e x $190/MT CO2e = $14,250.

That sends a perverse market incentive to target the Back Bay condo in the example above that Acadia Center is not comfortable with. This issue is too nuanced to be addressed by such a blunt policy mechanism.

**From a program administration perspective, assuming the same level of reduction for every full electrification project is clearly easier. However, relatively simple alternatives, such as estimating emissions reduction benefit of a project using the conditioned square footage and primary heating fuel of a particular housing unit would send a much more efficient market signal to obligated parties and help to address some of the largest-emitting housing units in the near-term. DEP could also consider using funds generated via the Just Transition Fee or ACPs to provide supplemental equity protections designed to help incentivize greater uptake of retrofits in low- and moderate-income owned/occupied buildings and/or geographic areas bearing elevated environmental burdens and historic housing underinvestment.**

## The CHS Should be Expanded to Credit Electrification of Water Heating

The Framework states that *"building sector emissions have recently been in the range of 24 MMT pear year, so reductions of 1 MMT per year over the 2026-2050 time period would reduce emissions to near zero in 2050."* On its face, this general trajectory makes sense – building sector emissions in 2021 were 23.8 MMT $CO_2e$, and the 2050 CECP requires that building sector emissions reach a "near zero" level of 2.0 MMT $CO_2e$ by 2050, a 95% reduction below 1990 levels.[17] However, based on the Massachusetts 2050 Decarbonization Roadmap analysis, GHG emissions from space heating only account for approximately 75% the building sector emissions[18] captured in the state's GHG Inventory. Water heating (23%) makes up the bulk of non-space heating emissions in the buildings sector. **Put in 2021 terms, this means that approximately 6.0 MMT CO2e of the total 23.8 MMT CO2e building sector emissions come from end-uses outside of space heating.**

Simultaneously, the FAQ document developed by DEP indicates that Framework *"focuses on space heating….other equipment types are not addressed to limit program complexity."* This seems like a fundamental disconnect in program design – **how is the CHS intended to achieve "near zero" emissions in the building sector by 2050 if decarbonization of end-use technologies (namely water heating) that account for 25% of building sector emissions are not credit eligible under the CHS?** Acadia Center strongly urges DEP to include water heating electrification as an eligible CHC generating measure, especially considering the fact that these technologies, such as heat pump water heaters, may also pose significant emissions-reducing and grid-service benefits to the electric sector, given the time-flexible nature of their consumption. Without the inclusion of water heating, the CHS lacks the ability to achieve the 2030 and 2050 subsector emissions limits. The CHS represents the best policy tool for rapidly decarbonizing water heating in the Commonwealth – relying on Mass Save to achieve the majority of water heating electrification would put undue financial burden on the backs of electric ratepayers. The CHS is an opportunity to spread the upfront costs of the water heating electrification transition to natural gas and delivered fuels customers as well. While Acadia Center acknowledges that expanding the CHS to cover water heating will present some level of additional administrative burden on DEP – the benefits of expanding the program to cover water heating far exceed the costs of this additional administrative burden.

## Overarching Policy Design Recommendations

### Equity Policy Mechanisms Demonstrate Commitment to Centering Equity

**Overall, Acadia Center would like to commend DEP on the equity provisions proposed in the Framework. Centering equity in the CHS is of core importance to Acadia Center. The 25% low-income full electrification carve out, a just transition fee representing 10% of the ACP value of all non-low-income full electrification projects, and a full electrification ACP value that is doubled for all low-income full electrification projects combine to form a policy that is clearly heavily emphasizing delivering significant benefits to low-income communities.** Our primary lingering concern with this proposal is that it is not clear why the Just Transition Fee only applies to full electrification credits, and not to, for example, emissions reduction credits generated via biodiesel sales. This appears to put a disproportionate burden on full electrification projects to fund the Just Transition Fee. Acadia Center requests more information from DEP on the logic behind this policy design decision and looks forward to engaging more on this topic in 2024.

Acadia Center agrees with DEP that utilizing ACP funds and just transition fee revenues to provide additional financial support to low-income households during particularly cold winters or periods of high energy prices would be a high-value use of these fundings streams. Acadia Center looks forward to working with DEP to understand how

[17] https://www.mass.gov/doc/2050-clean-energy-and-climate-plan/download Table 3-2, at 19
[18] https://www.mass.gov/doc/buildings-sector-technical-report/download, at 9

these funds could be most effectively used to support low-income residents. As described in detail above, Acadia Center does not think that DEP's proposed assumption that all fully electrified housing units in the state (regardless of housing unit square footage) reduce 5 MT CO2e of emissions per year is a viable mechanism for addressing equity concerns within the CHS – the carve out, just transition fee, and higher ACP for low-income electrification projects are better mechanisms to address equity.

### Acadia Center Fully Supports Emissions Avoided ACP of $190/MT CO2e and Requests Further Quantitative Justification for the Full Electrification ACP Values

Firstly, Acadia wholeheartedly supports setting the emissions avoided ACP value at $190 per MT $CO_2e$ in line with the US EPA estimate, newly enshrined in a legally binding federal regulation.[19] Setting the emissions avoided ACP at this value is essential to the success of the CHS.

With regard to the full electrification ACP values, it's important to set Alternative Compliance Payments (ACP) at a value that is high enough to discourage over-reliance on the ACPs as the primary compliance mechanism. After all, the ultimate goal of the CHS is to have actual electrification projects in buildings completed. The Framework proposed setting Alternative Compliance Payment (ACP) values for non-low-income full electrification projects at $6,000 in 2026, escalating to $10,000 by 2030, with the proposed ACP values for equivalent low-income projects being set at double that amount. It's challenging to fully evaluate the projected effectiveness of these full electrification ACP values in preventing over-reliance on ACPs without rigorous, complex quantitative analysis that Acadia Center has yet to see from DEP. We highly encourage DEP to pursue this analysis and share the results with stakeholders. The future role of Mass Save and the level of future heat pump incentives DEP anticipates under Mass Save is a large X-factor in this analysis. While Acadia Center acknowledges that DEP does not control Mass Save program design, it would be useful for stakeholders to have some idea of the level of heat pumps incentives DEP is projecting under Mass Save, and how that projection influenced the proposed value at which DEP set the full electrification ACPs.

### Concerns that the CHS is Not Designed to Achieve 2030 CECP Building Subsector Limit

The Framework suggests an emissions reduction standard of 1 million metric tons (MMT) of $CO_2e$ per year from 2026 – 2050. As of the 2021 Massachusetts Greenhouse Gas (GHG) Inventory, the buildings sector emits 23.82 MMT $CO_2e$.[20] While Acadia Center acknowledges that this annual reduction target of 1 MMT $CO_2e$ sets the Commonwealth on course to achieve the overarching 2050 buildings sector GHG target outlined in the 2050 CECP, we are highly skeptical that it is aggressive enough to achieve the 2030 buildings sector sublimit of 15.0 MMT $CO_2e$ established in the 2030 CECP, and none of the quantitative analysis provided by DEP to date has addressed our concerns on this topic.[21] The "Compliance Calculator" Excel file[22] recently posted on DEP's CHS website indicates "total annual building sector emissions" of 20 MMT CO2e in 2030, which is well short of the 2030 subsector target.

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[19] https://www.epa.gov/controlling-air-pollution-oil-and-natural-gas-operations/epas-final-rule-oil-and-natural-gas.

[20] https://www.mass.gov/doc/appendix-c-massachusetts-annual-greenhouse-gas-emissions-inventory-1990-2020-with-partial-2021-2022-data/download.

[21] Massachusetts Clean Energy and Climate Plan for 2025 and 2030, Page 56 https://www.mass.gov/doc/clean-energy-and-climate-plan-for-2025-and-2030/download.

[22] https://www.mass.gov/info-details/massachusetts-clean-heat-standard.

**Clean Heat Standard Draft Program Framework Inputs**

This spreadsheet presents the source of the numbers presented in the Clean Heat Standard Draft Program Framework

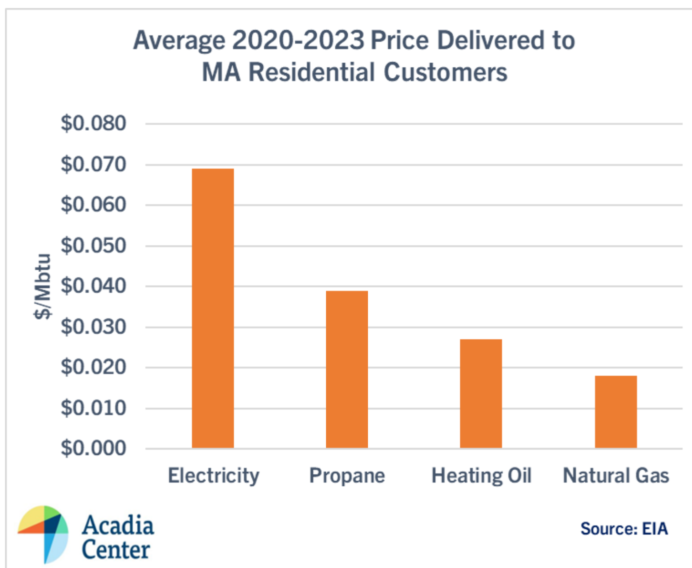
Light green cells are numbers as described in the Draft Program Framework document
Dark green cells show the numbers that will be specified in the Clean Heat Standard regulation, once proposed

| *Assumptions* | 2026 | 2027 | 2028 | 2029 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|---|---|---|---|---|---|---|---|---|
| Total annual electricity consumption (MWh assumed) | 60,000,000 | 60,000,000 | 60,000,000 | 60,000,000 | 60,000,000 | 90,000,000 | ########## | ########## | ########## |
| Total annual building sector emissions (MT assumed) | 24,000,000 | 23,000,000 | 22,000,000 | 21,000,000 | 20,000,000 | 15,000,000 | 10,000,000 | 5,000,000 | - |

In order for the 1 MMT $CO_2e$ annual reduction from 2026-2030 to achieve the 2030 sublimit, 2025 building sector emissions (the year prior to the CHS being put into effect) would need to be at a maximum level of 20.0 MMT $CO_2e$, or 16% below 2021 levels. Acadia Center has not seen evidence to suggest that this 16% reduction in emissions from 2021-2025 will be achieved and is interested in obtaining more information regarding DEP's assumptions of building sector emissions trajectory over the 2021-2025 time period and how this projection was determined. In the absence of evidence to support the 16% decline in building sector emissions in the 2021-2025 time period, Acadia Center suggests taking the conservative approach of assuming that 2025 emissions levels are similar to 2021 levels (~23.8 MMT $CO_2e$) for CHS policy design purposes. Taking this more conservative approach would necessitate an annual emissions reduction in building sector emissions of 1.76 MMT $CO_2e$ per year from 2026-2030 to achieve the 2030 subsector limit.

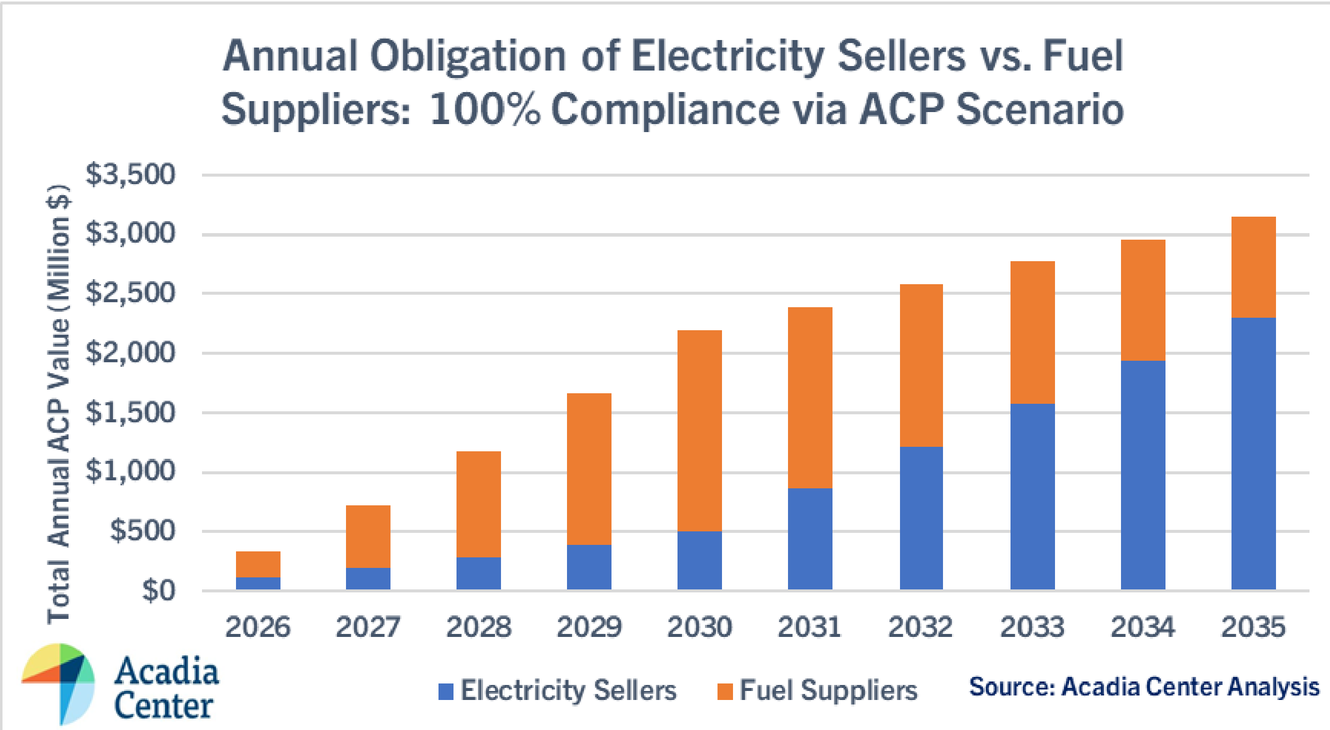
## DEP Needs to Justify Any Compliance Obligation Placed on Electricity Sellers in the Context of the Relative Cost of Electricity Compared to Fossil Fuels on a $/Btu Basis

One of the core challenges facing the building electrification transition in Massachusetts is the relatively high cost of delivered electricity, on a $/Btu basis, compared to natural gas, propane and oil. Despite air-source heat pumps (ASHPs) typically being approximately 2.75x-3x more efficient than combustion-based space heating systems, the potential annual utility bill savings from electrifying buildings is significantly hampered by the relatively high cost of electricity compared to fossil fuels.




For example, based on the average price of fuels delivered to residential customers in Massachusetts from 2020-2023 on a $/BTU basis, electricity was approximately 3.8x more expensive than natural gas. This makes the economics of building electrification challenging, even if a heat pump is operating at 275% efficiency and a gas furnace is operating at 85% efficiency over the course of a year. **One of the core goals of the CHS should be to close the $/Btu "gap" between electricity and fossil fuels, particularly in the early years of the program (e.g., 2026-2030). If that gap is not closed, or at least partially closed to a degree that the efficiency of heat pumps can compensate for the price gap across fuels, encouraging electrification at the scale needed to achieve the building subsector targets will be near impossible, regardless of the level of upfront incentives offered for space heating electrification. Acadia Center has not seen sufficient evidence that the CHS, as currently proposed, is designed to close this gap.**

The graph below evaluates a hypothetical scenario where 100% of compliance of both the full electrification obligation and the emissions reduction obligation is met through ACPs. This is useful in attempting to assess the relative scale of the *combined obligations* on electricity sellers versus fuel suppliers.




In the 2026 – 2030 time period, the percent of the total obligation burden falling on electricity sellers, based on Acadia Center calculations, falls between 23%-35%. Post-2030, the percent of the total compliance obligation that falls on electricity sellers climbs rapidly, reaching 73% in 2035. **Rigorous, transparent quantitative analysis from DEP to justify the percent of the total compliance obligation falling on electricity sellers is essential for stakeholders to evaluate the implications of this proposed decision, and to date, this type of analysis has not been shared with stakeholders.** While Acadia Center acknowledges that, from 2026-2032, a larger share of the total obligation falls on fuel suppliers, we are highly skeptical that these fuel supplier obligations are high enough to correct for the current discrepancy between fossil fuels and electricity on a $/Btu basis. **The near-term goal of the CHS (e.g., 2026-2030) should be to help close the price gap between electricity and fossil fuels, and the obligation burden on electricity sellers should be "back-calculated" based on this price gap analysis and designed in such a way to close the price gap. Once the price gap is closed, the CHS can explore the topic of shifting some obligation burden onto electricity sellers, but no obligation should be placed on electricity sellers until that price gap is closed. This is an area of critical importance in the CHS design, and Acadia Center looks forward to engaging extensively with DEP on this topic and reviewing any quantitative analysis DEP produces on this topic.**

## Develop an Electrification Standard for the Commercial Sector

Acadia Center would like to commend DEP for the inclusion of a residential full electrification standard, in addition to the emissions reduction standard. As highlighted in the Massachusetts 2050 Decarbonization Roadmap, 2025/2030 CECP, and 20250 CECP – electrification of space heating in buildings is a central pillar of decarbonization in the building sector. Thus, the electrification standard places critical guardrails on the CHS by ensuring that residential buildings will not become overly reliant on biofuel decarbonization strategies. Decarbonization strategies that may appear attractive in the near-term, including biodiesel blending, are often in direct conflict with the most cost-effective long-term pathway to achieving the overarching target of net zero emissions by 2050. Because full electrification of buildings is a core element of the most cost-effective trajectory towards net zero emissions, as highlighted by DPU Order 20-80-B, the guardrails provided by the electrification standard are essential.

For this reason, Acadia Center feels that it is necessary for the CHS to extend some form of electrification standard to non-residential buildings. As of 2021, non-residential buildings make up 49.3% of total building sector emissions in the Commonwealth. The 2025/2030 CECP highlighted the need for "over 300 million square feet of commercial space with electric heat by 2030"[23] **The two scenarios shown to be most cost-effective in the 2050 CECP (Phased and High Electrification Scenarios) demonstrated a 257% and 276% increase in commercial electric space heating demand between 2020 and 2050, respectively. The same scenarios showed a 44% and 76% increase in commercial electric space heating demand between 2020 and 2030.[24] These metrics related to projected electric space heating demand or projected square feet of non-residential square footage with electrified heat could provide a metric that a CHS non-residential building electrification standard could be tethered to.**

While limited supplies of relatively low-cost biodiesel may place a "natural cap" on the level of emissions reductions that can be achieved in the non-residential building sector from biofuels, and thus encourage non-residential electrification to comply with the CHS emissions obligation, Acadia Center urges DEP to develop an electrification standard for the non-residential building sector. **The same logic that led DEP to propose the electrification standard in the residential sector also applies to the non-residential sector – a non-residential electrification standard would place critical guardrails on the non-residential building decarbonization strategy to ensure it does not stray too far from the cost-effective trajectories laid out in the CECP.** Without these guardrails – the CHS is exposed to the inherent risk associated with biofuel decarbonization strategies. These risks are multi-faceted:

- **Low supply and escalating costs of biofuels as competition increases:** Relatively low cost of biodiesel in the near-term does not imply relatively low cost of biodiesel in the medium- or long-term. Because feedstocks of climate-beneficial biomass feedstocks are inherently limited, as other states and other sectors of the economy (e.g. air travel, shipping, high-heat industrial) move towards decarbonization in future years, the competition for and price of alternative fuels will undoubtedly increase. Failure to rapidly electrify the non-residential building sector will expose these buildings, and the Commonwealth more broadly, to this risk.

- **Uncertainty with biofuel life-cycle GHG accounting:** There is a *high degree* of uncertainty regarding GHG accounting for biofuels. As DEP is aware, life-cycle accounting for biofuels is still an emerging field. Future improvements in life-cycle accounting and changes to formally adopted GHG accounting

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[23] Massachusetts Clean Energy and Climate Plan for 2050 Page 20 https://www.mass.gov/doc/2050-clean-energy-and-climate-plan/download

[24] Massachusetts Clean Energy and Climate Plan for 2050 Workbook for Energy Modeling Results, "4. Commercial Space Heating" tab https://www.mass.gov/media/2553881/download

principles related to biofuels put strategies that rely too heavily on these fuels at risk of not actually achieving compliance with GHG reduction goals.

Should DEP choose to pursue a non-residential electrification standard, it may also be prudent to factor in the existence of known local-level policies driving electrification in non-residential buildings, particularly the City of Boston's Building Emissions Reduction and Disclosure Ordinance (BERDO) – so as to harmonize the programmatic interventions and avoid double-paying for any emissions reductions.

## The CHS Needs Policy Guardrails on Wood Combustion for Space Heating

The Framework is proposing to regulate electricity, natural gas, heating oil, and propane. There is one notable space heating fuel missing from the regulation – wood. It is critical that the CHS address wood combustion for space heating at some level. **Implementation of the Framework as it currently stands would immediately make combustion of wood for space heating a more attractive financial proposition for homeowners. Obligated parties would pass through some level of costs to electricity, natural gas, propane, and heating oil consumers, raising the relative costs of those fuels on a $/Btu basis, but the regulation would have no direct impact on the price of wood.** Acadia Center sees this as a major flaw in the policy and would not be surprised by a dramatic spike in wood combustion in the years following implementation of the CHS as currently designed. This potential spike would have significant negative consequences both from a GHG emissions perspective (any life-cycle benefits of wood combustion for space heating are highly variable with large degrees of uncertainty) and a criteria air pollutant/indoor air quality perspective. **While we acknowledge the difficulty in regulating wood combustion, and do not have detailed proposal on how to do so at the moment, we strongly urge DEP to put thought into potential policy guardrails preventing a wood combustion spike. We look forward to collaborating with DEP on this topic.**

## Make Early Action Full Electrification Projects Eligible for Generation of Future Emissions Credits

The Voluntary Clean Heat Standard Early Registration Program document developed by DEP mentions that "Credits associated with the ongoing operation of a heating system are not included in the early action program, although projects that qualify in the early action program *may receive administrative benefits in generating credits associated with operation of a clean heat system once a Clean Heat Standard is established*." **Acadia Center strongly urges that DEP develop Early Registration guidance that makes it clear that Early Registration full electrification projects will definitely generate emissions avoided CHCs once the program officially kicks off in 2026, assuming they meet the compliance requirements demonstrating the system is actually operating in its intended capacity in, for example, 2026 – 2032.** This will send a strong market signal encouraging the deployment of full electrification projects prior to official launch of the CHS in 2030, and this strong market signal will likely be necessary to actually achieve the 2030 buildings subsector emissions target of 15.0 MMT $CO_2e$ established in the CECP.

As currently proposed, a large portion of the "avoided ACP" value to obligated parties of full electrification projects is in the credits generated from future streams of emissions avoided credits. Let's take, for example, a non-low-income full electrification project that occurs in 2026, and let's assume that system operates for 15 years. The avoided full electrification ACP value is $6,000, but the future streams of avoided emissions ACP total $14,250, combining to a total "avoided ACP" value of $20,250. **In other words, 70% of the avoided ACP value to obligated parties of that full electrification product is coming from the future emissions avoided credits. If early action full electrification**

**projects don't have at least partial, post-2026 access to the future emissions avoided credit generation value, that will serve a very strong disincentive against obligated parties pursuing those projects pre-2026.**

### Hybrid Electrification Credits Should Have "Cold Climate Heat Pump" Eligibility Requirement

The proposed Early Registration Program highlights the importance of a full electrification eligibility requirement that ASHPs "meet Cold Climate Air Source Heat Pump Specification Version 4.0 published by Northeast Energy Efficiency Partnerships effective January 1, 2023, or any version thereafter." Acadia Center wholeheartedly agrees with this requirement, but this eligibility requirement should be extended to hybrid electrification projects – both in a scenario where hybrid electrification projects are considered eligible in Early Registration or in a scenario where these systems are only eligible for credit generation once the CHS officially kicks off in 2026. The December 7th webinar mentioned hybrid electrification projects would still be eligible for the hybrid electrification credit if "non-cold climate heat pumps" were installed. It's critical that all heat pumps installed in New England be cold climate heat pumps – the marginal cost difference on installing cold vs. non-cold climate heat pumps is minimal, and the deployment of cold climate ASHPs will better position these hybrid buildings for 1) Eventual full electrification and/or 2) More flexibility in future adjustments to the "switch over" temperature of the hybrid system. Greater future flexibility to lower this switch over temperature, for example from 30F to 5F, comes with a multitude of potential benefits including reducing utility bill costs to consumers and reducing GHG emissions.

### Some Cap on ACPs is Needed to Ensure Electrification Projects Completed in Near-term

The Framework proposes that "Compliance through alternative compliance payments (ACPs) would also be allowed without limit…." Acadia Center does not see the rationale in putting *no limit* on ACPs and would like more information from DEP on the rationale behind this decision. Why not place some cap on the level of ACPs obligated parties can purchase to ensure that some minimum level of building space heating electrification projects actually get completed? **Acadia Center highly recommends that DEP look into this topic in more detail and propose some limit (and the quantitative justification for that limit) to stakeholders. Acadia Center looks forward to engaging with DEP on this topic in more depth in 2024.**

## Conclusion

In summary, Acadia Center appreciates the opportunity to comment in the early stages of this important CHS program design. We commend DEP on several key elements of the proposed Framework, including with respect to the ineligibility of gaseous biofuels and hydrogen blending as well as the strong equity provisions put forward. Despite this, we do raise a number of outstanding questions and concerns regarding other program elements and design proposals, and sharing greater quantitative analysis will help stakeholders provide more detailed commentary on these elements in question and on the program in its entirety. Thank you in advance for the consideration and review of our input, and we look forward to engaging further with DEP in the months ahead to refine the Framework and move toward implementation. If you have any questions or concerns, please do not hesitate to reach out.

Sincerely,

Ben Butterworth
Director: Climate, Energy & Equity Analysis
bbutterworth@acadiacenter.org
617-742-0054 ext.111

## Parnay, Angela L (DEP)

| | |
|---|---|
| **From:** | Beverly Adamsky <Beverly.Adamsky.633650806@grsdelivery.com> |
| **Sent:** | Thursday, December 14, 2023 12:42 PM |
| **To:** | Strategies, Climate (DEP) |
| **Subject:** | Please Consider the Impact of the Clean Heat Standard on the Residents of Massachusetts |



Dear Department of Environmental Protection members, As a Massachusetts resident and small business owner, I am writing to express my concerns regarding the DEP's Clean Heat Standard. While I strongly support climate action, forcing Massachusetts residents to phase out and replace their products by increasing the cost of fuel does more harm than good. The Clean Heat Standard would devastate the locally owned retailers in the Commonwealth. Further, this plan is essentially a tax on all Massachusetts residents without the assurance of emission reductions. The CHS completely ignores the carbon intensity of electricity generation from the grid while simultaneously excluding biomass, which qualifies for a federal tax credit in the Inflation Reduction Act. In fact, the CHS draft framework states that "standards would be inclusive of clean heat supported by other programs, such as federal tax credits." We agree with these inclusive standards. The federal Biomass Tax Credit, included in the Inflation Reduction Act, strengthens our case that biomass should be included in the Clean Heat Standard. This type of forced electrification jeopardizes businesses and residents' ability to choose affordable, reliable heating. In your capacity, and as representatives of Massachusetts, please think about the impact of the CHS on small businesses, jobs, Massachusetts residents, and consumer choice. Please consider revising the Clean Heat Standard to include more affordable home heating options. Thank you. Sincerely, B. Adamsky

MassDEP Clean Heat Standard

ISO New England Economic Planning for the Clean Energy Transition (EPCET)

Presentation on Grid Impact from EVs and Heat Pumps

Technical review by Raymond J. Albrecht PE

November 30, 2023

**Summary Biography for Raymond J. Albrecht PE**

Consulting environmental engineer 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 in the early 1980s. Principal of Raymond J. Albrecht LLC for the past 15 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**

MassDEP has made multiple recent public statements that electricity will be considered as having a carbon score of zero under the proposed Massachusetts Clean Heat Standard. The MassDEP position has recently been rebutted by a major ISO New England evaluation study of the grid impact by electric vehicles and heat pumps. The study has been performed under the Economic Planning for the Clean Energy Transition (EPCET) effort during the past year.

The ISO New England study makes several important points:

1) Essentially all electricity for EVs and heat pumps in New England during the next 10 years, through 2032, will come from fuel-fired generation units.

2) Practically none of the additional generation needed during the next 10 years for EVs and heat pumps will be provided by solar PV or wind.

3)  The ambitious build-out of wind and solar planned by the New England states for the next 10 years will only offset existing grid loads.

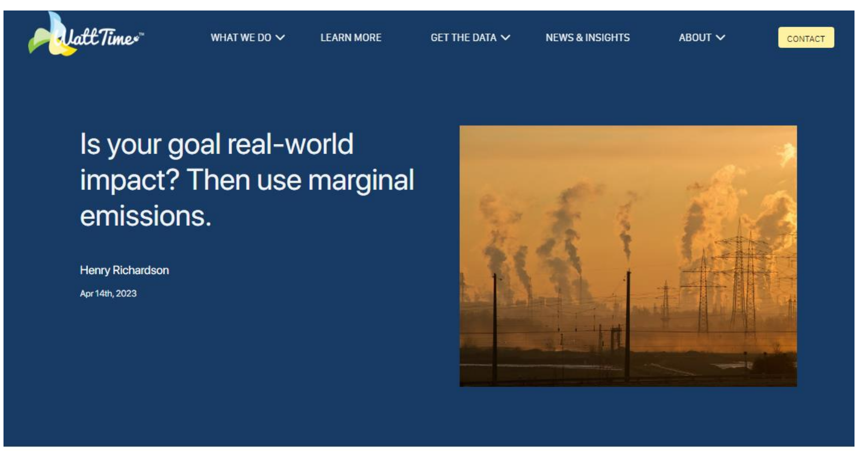
4)  Only after the completion of approximately 37,000 MW of solar and wind resources for the existing grid, and then construction of additional capacity thereafter, would significant quantities of renewable energy become available for serving EV and heat pump loads.

5)  Additional grid loads from EVs and heat pumps will require another 60,000 MW of solar and wind capacity, for a total New England grid capacity of nearly 100,000 MW of solar and wind.

The MassDEP position claiming zero carbon intensity for electricity is also in conflict with the USEPA AVoided Emissions and GeneRation Tool (AVERT) methodology for the evaluation of grid emissions due to changes in load or renewable generation capacity.  The AVERT model yields nearly identical results as the ISO New England EPCET study, in pointing to the continuing and almost exclusive use of fuel-fired power generation for EVs and heat pumps over the next 10 years.

Both the ISO New England EPCET study and the USEPA AVERT model support a science-based argument for using a carbon score of over 1,000 lbs $CO_2e$ per MWh for electricity under the proposed Massachusetts Clean Heat Standard.

MassDEP also needs to recognize the need for using marginal emission rates for electricity, rather than average grid mix figures.  The *WattTime* organization, a subsidiary of the Rocky Mountain Institute (RMI), has established a nationwide program to support efforts by commercial, industrial and institutional customers to undertake energy measures which are based on how the grid actually works.



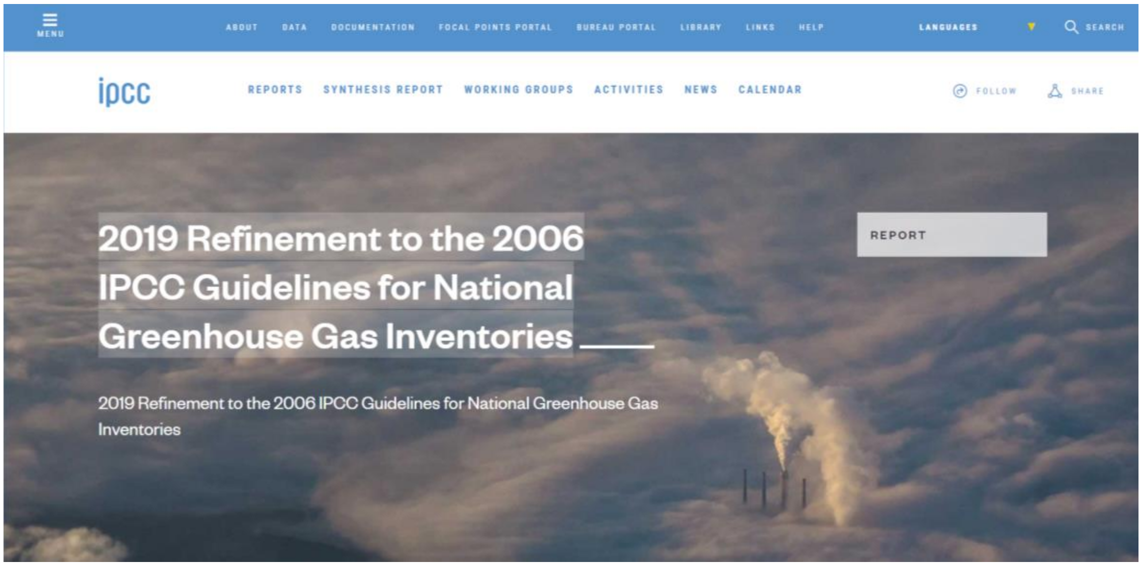

Everyone knows you can't manage what you don't measure. Less often pointed out? You can't manage what you measure *incorrectly*.

Corporate net-zero targets are at an all-time high, per reporting from *The Economist*. In fact, fully 75% of the world's largest corporate greenhouse gas emitters have set net-zero by 2050 (or sooner) targets, as of an October 2022 benchmarking analysis by Climate Action 100. This is good news.

Or... it should be. Of course, these targets will only genuinely decarbonize the atmosphere if they measure the real thing. And, unfortunately, that's not always what happens.

See https://www.watttime.org/news/is-your-goal-real-world-impact-then-use-marginal-emissions/ for more information on the need for using marginal emission rates for electricity.

Finally, MassDEP is strongly encouraged to use life-cycle accounting (LCA) for all energy resources under the Clean Heat Standard. This should include being respectful of guidance by the United Nations Intergovernmental Panel for Climate Change (IPCC) for evaluating the upstream CO2 and methane emissions of all fuels used for generation of electricity. MassDEP needs to study the IPCC report entitled, *2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories.*

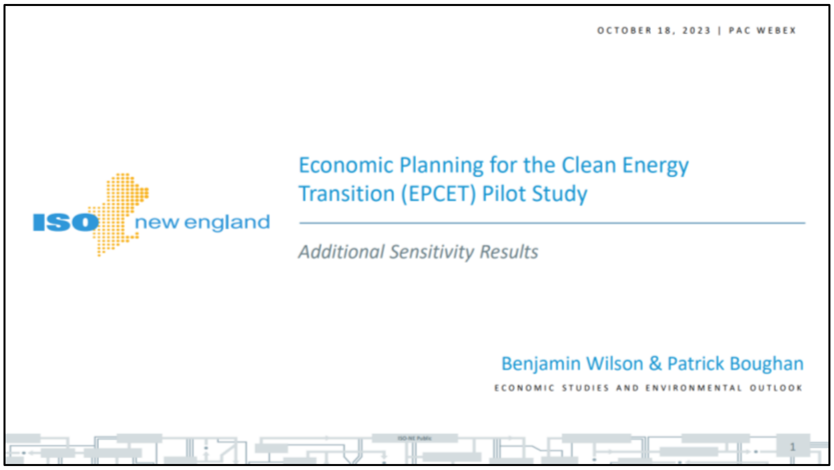



The UN IPCC is comprised of several thousand, respected scientists and engineers and is the premier organization for understanding and addressing climate change. It is understood that the UN IPCC 2019 guidelines are inconvenient to the MassDEP case for assigning a carbon intensity of zero to electricity used for heat pumps. But it is nevertheless incumbent on MassDEP to give due heed to the UN IPCC.

**Technical Notes on Individual ISO New England EPCET Presentation Slides**

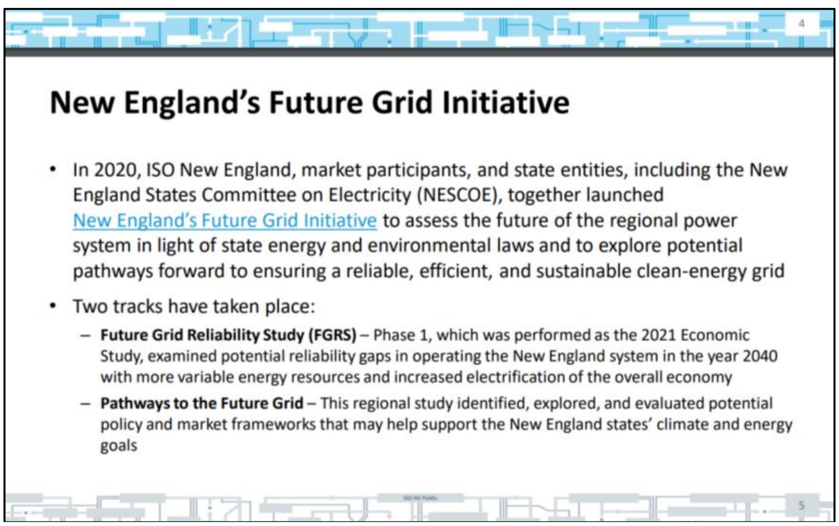
ISO New England recently posted a presentation showing the results of their analysis of grid impacts that will result from forecasted market growth by heat pumps and EVs through the year 2032 and beyond. The presentation entitled, Economic Planning for the Clean Energy Transition (EPCET), is available at https://www.iso-ne.com/static-assets/documents/100004/a06_2023_10_18_pac_epcet_additional_sensitivity_analysis_results.pdf.

The ISO New England EPCET work was requested by the New England States Committee on Electricity (NESCOE), which represents all six states in the region. ISO New England planning staff have been tasked with performing hourly analyses of grid loads and generation which could then be used to chart a course toward decarbonization across an expanded grid.

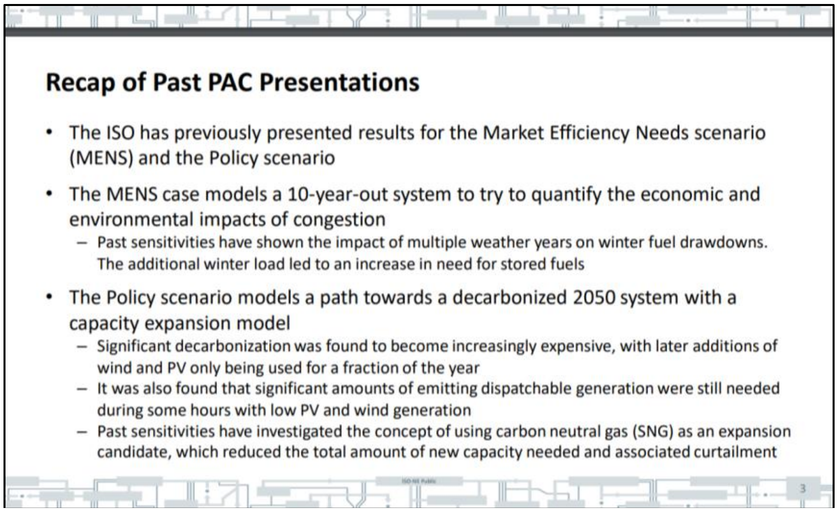



The EPCET work takes a very methodical and logical approach to analyzing the incremental effects of heat pump and EV loads on the grid. It is the first formal analysis published for New England to use such rigorous, hourly analysis to characterize power generation needed for heat pumps and EVs. These technical notes focus on the heat pump portion of the ISO New England EPCET presentation.

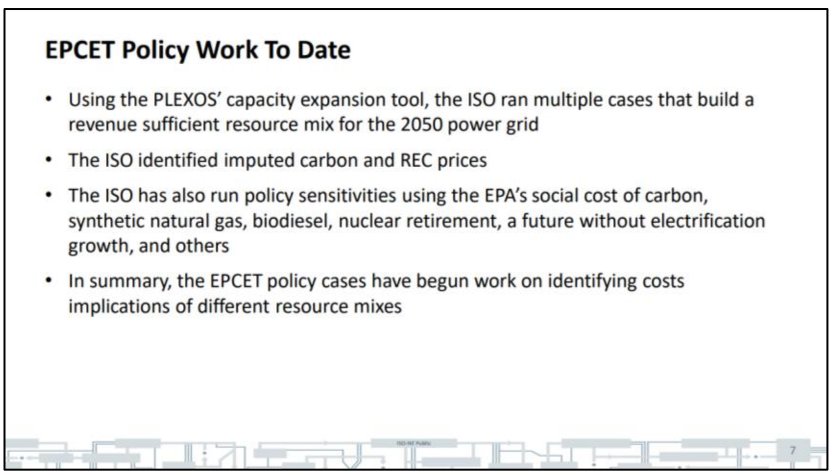
The next slide explains the context for the ISO New England EPCET analyses.




As described in the next slide, the ISO New England EPCET analyses have previously looked at the capital cost challenge of serving an expanded grid load entirely with solar, wind and battery storage. The analyses have more recently begun to consider the use of renewable fuels (hydrogen/synthetic natural gas/biodiesel) to fill in the gap when solar and wind outputs are low due to unfavorable weather.

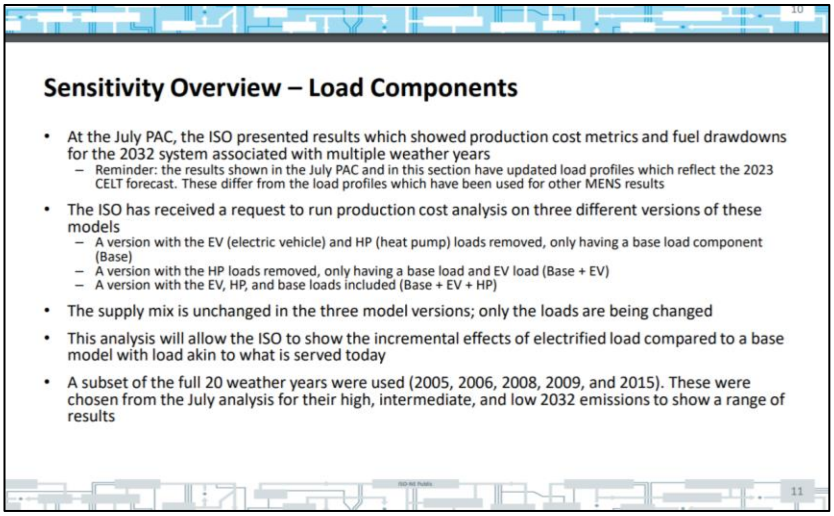



The analyses have looked at the impact of nuclear plant retirements through the year 2050. Nuclear plants generally run 24/7 when operational and thus present a significant challenge. The analyses have used rigorous logic in evaluating the expected trajectory of grid decarbonization without electrification.

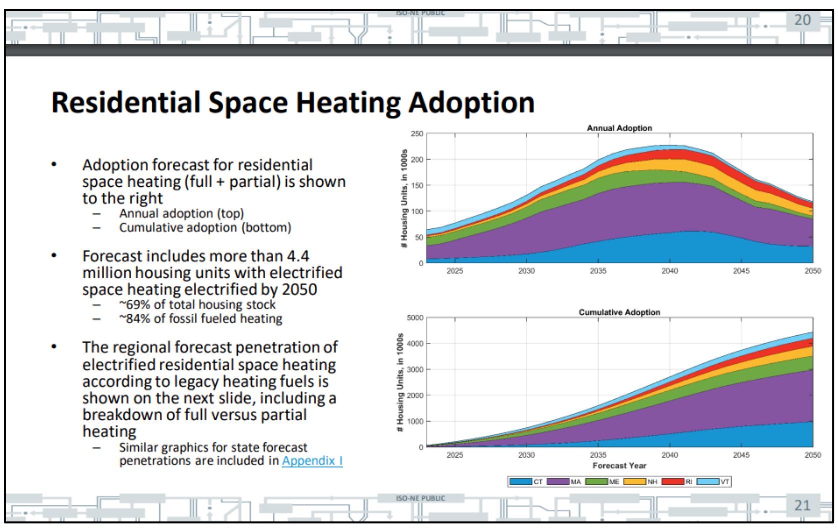



The referenced ISO New England EPCET presentation describes the logic used in evaluating the decarbonization of the existing grid then studying the incremental impacts of EVs and heat pumps. The EPCET analysis used five previous weather years to achieve a high/intermediate/low range of emissions results.

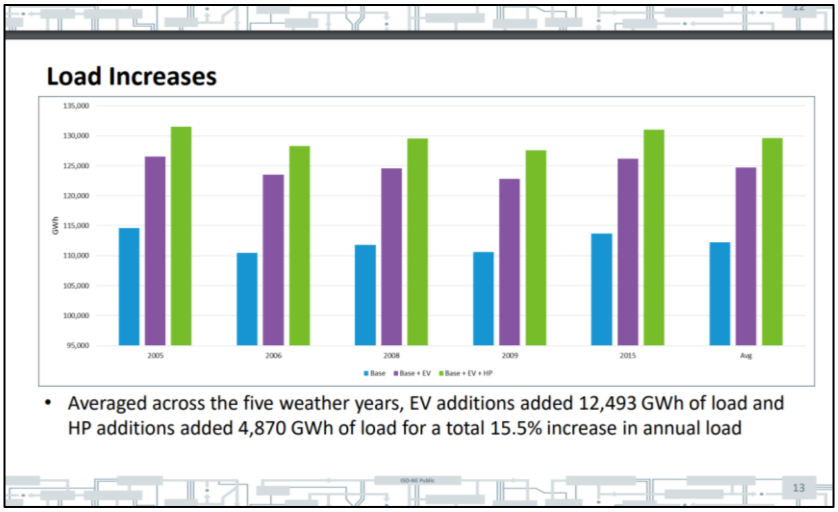
ISO New England had originally combined increasing grid loads and renewable generation into their hourly models, which then made it difficult to decipher the cause-and-effect attributes of individual actions. They then started to use discrete model shocks to analyze the separate impacts of increasing loads and generation capacity.




The graph below shows the individual state forecasts for heat pump implementation in New England. The ISO New England present addresses the grid impacts expected by 2032 resulting from just over one million homes in New England, which is something less than 20% of the residential housing stock, with about 30% of the heat pump installations expected to have full capacity, the remainder would be partial-capacity, single-head units.




The graph below shows the significant MWh grid load increases that will result from the first wave of EVs and heat pumps over the next 10 years. The base case of existing grid with no electrification is shown in blue, then base + EVs is shown in purple, then base case + EVs + heat pumps is shown in green. Since about 30% of the first million heat pump units would be of the full-capacity type, the heat pump numbers in the graph represent the equivalent of about 500,000 residential units with full-capacity heat pumps, out of a total residential building stock approaching 6 million units in New England.




The ISO New England presentation models the renewable grid capacity growth that would be necessary by the year 2050 to meet the loads incurred by the approximately 80 percent market share for heat pumps forecasted by ISO New England and the individual states. According to the presentation, about 37,000 MW of nameplate capacity of solar, wind and battery storage could meet nearly 100 percent of existing grid loads. By comparison, for the levels of EV and heat pump market growth forecasted by the year 2050, approximately 97,000 MW of nameplate capacity of renewable generation would be required. The ISO New England analysis uses partial shares of the renewable generation buildout for the 2032 portion of its work.

## No Electrified Load Growth: Resource Buildout (MW)

| | 2050 Nameplate (No Electrified Load) | 2050 Nameplate (Base Model) |
|---|---|---|
| PV | 24,723 | 26,338 |
| LBW | 4,309 | 7,500 |
| OSW | 3,277 | 30,233 |
| BESS | 7,655 | 33,000 |
| Total | 39,314 | 97,071 |

- ~40,000 MW of new capacity was built to decarbonize without the electrified load. In the base model with electrified load (+87 TWh), almost ~100,000 MW of new capacity was built
- Smaller amounts of wind are built. The majority of new capacity is from PV and energy storage

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The table below shows the average generation by fuel type (GWh) for the three scenarios (base then add EVs then add heat pumps) for the year 2032. The table shows that the initial increment of renewable generation in place by 2032 would be fully used by just the existing grid. The table then shows that essentially all additional electricity loads, for EVs and heat pumps, will have to be met by natural gas, oil and coal.

## Average Generation by Fuel Type (GWh)

| | ADR | COAL | OIL | MSW/LFG/ WOOD | NG | LNG | NUC | HYDRO | PV | LBW | OSW | TIE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Base (GWh) | 1 | 167 | 11 | 6,133 | 12,302 | 1,185 | 29,600 | 6,192 | 14,323 | 3,932 | 13,236 | 25,636 |
| Base + EV (GWh) | 4 | 312 | 156 | 6,321 | 21,684 | 1,719 | 29,600 | 6,597 | 14,643 | 4,175 | 13,606 | 26,504 |
| Base – Base + EV % Increase | 259 | 86 | 1,287 | 3 | 76 | 45 | 0 | 6 | 2 | 6 | 3 | 3 |
| Base + EV + HP (GWh) | 7 | 493 | 834 | 6,461 | 24,668 | 2,366 | 29,600 | 6,592 | 14,614 | 4,164 | 13,525 | 26,859 |
| Base + EV – Base + EV + HP % Increase | 100 | 58 | 434 | 2 | 14 | 38 | 0 | 0 | 0 | 0 | 0 | 1 |

- These values represent the average of the five weather years simulated (2005, 2006, 2008, 2009, and 2015)
- The most significant increases in generation by fuel type are by expensive and/or emitting fuel sources (ADR, coal, oil, NG, and LNG)
- The most significant individual increase is in oil – while the Base case has minimal need for oil (11 GWh), the Base + EV + HP case has a ~7,300% increase in oil generation (834 GWh)



The next graph shows that $CO_2$ emissions would be about 2.3 million tons per year for the roughly 500,000 equivalent full-capacity heat pumps installed over the next ten years. This aligns closely with other published analyses that show homes with full-capacity heat pumps causing about 5 tons of $CO_2$ emissions per year based on the carbon intensity of electricity. The ISO New England forecast of something over 25,000 MW peak load for residential heat pumps is in close alignment with other published forecasts.

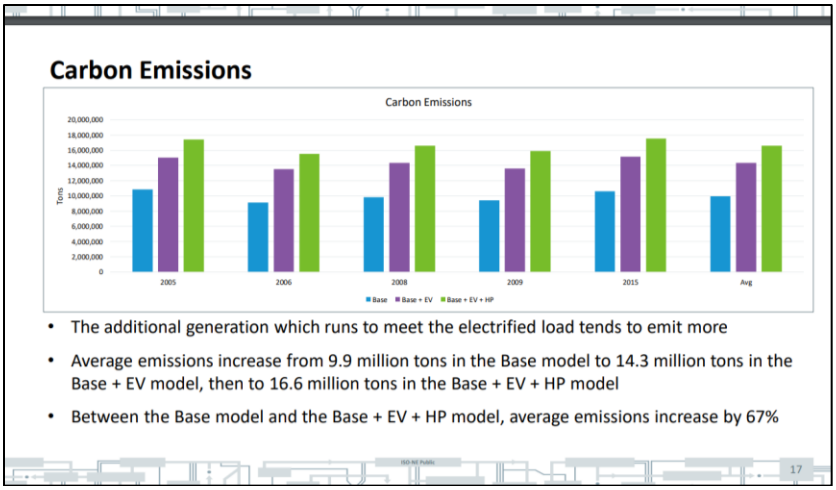
The graph below also highlights that EVs would produce lower MW peak loads but higher annual MWh consumption figures than forecasted for heat pumps. Heat pumps, compared to EV charging stations, have sharp load peaks during cold weather and result in lower MWh per year consumption per required MW of nameplate capacity.

Based on ISO New England figures, the annual load factor of the existing grid in New England is approximately 56 percent. The forecasted annual load factor for EVs would be approximately 43 percent, subject to management of charging activity during peak grid load hours. The forecasted annual load factor for heat pumps, by comparison, would be only 14 percent, which would likely lead to low technical and economic efficiency of capital-intensive renewable technologies such as solar and wind.

## Sensitivity Overview – No Electrified Load Growth

- All policy scenario models have been rerun with updated load profiles from the ISO-NE Load Forecasting team
- Policy scenario models have significant load growth by 2050:
  - 2050 EV load: 14,946 MW peak, 56.4 TWh of annual energy
  - 2050 HP load: 25,495 MW peak, 30.6 TWh of annual energy
  - For reference, 2022 New England load was 117 TWh. Load energy is expected to increase by ~75% by 2050
- Deep decarbonization is made more difficult by other sectors shifting their demand from fossil fuels to the electric sector
- To demonstrate what buildout would be needed to decarbonize a load similar to a current day New England load, a capacity expansion model has been run with no EV or HP load growth
- There has been a built in BTM-PV growth in other policy scenario models. This has been disabled in this model, as net loads become negative. Instead, it is held at ~5,500 MW

As shown in the next graph, ISO New England forecasts that the described 1 million heat pump units would increase electricity consumption by approximately 4870 GWh (or 4.8 million MWh) by 2032 and would result in increased direct CO2 emissions of 2.3 million tons of CO2. This is in close alignment with other published analyses showing that CO2 emissions would be about 5 tons per year per full-capacity, residential heat pump.



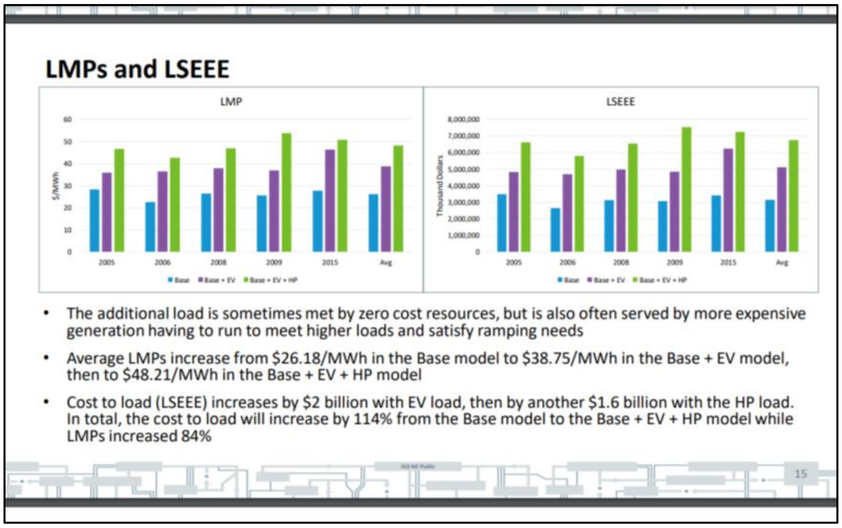

The CO2 emissions factor for the electricity produced for heat pumps would thus be 944 lbs CO2 per MWh. The ISO New England figure aligns closely with the non-baseload factor of 900 lbs CO2 per MWh for New England published by the US Environmental Protection Agency under the Emissions & Generation Resource Integrated Database (eGRID) program.

The ISO New England and EPA eGrid figures for CO2 emissions from electricity generation are onsite combustions only and do not account for upstream methane losses and CO2 emissions. Based on guidance provided by the Argonne National Laboratory GREET model and the UN Intergovernmental Panel on Climate Change (IPCC) 2019 guidelines, a full life-cycle analysis (LCA) for electricity typically yields an additional 15 to 30 percent higher factor for CO2e equivalent emissions depending on the timeframe (20 year vs. 100 year) used for methane emissions.

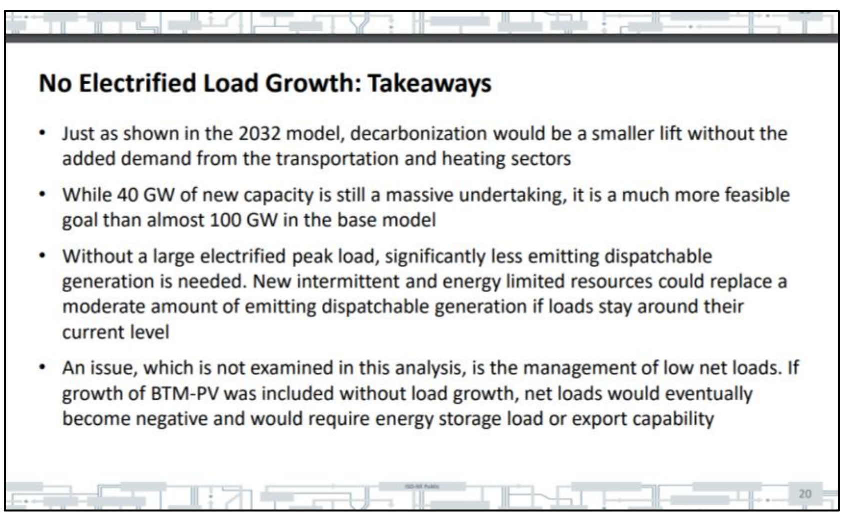
GREET and UN IPCC findings support a science-based argument for using a carbon score of over 1,000 lbs CO2e per MWh for electricity under the proposed Massachusetts Clean Heat Standard.

The ISO New England presentation also forecasts that average annual wholesale electricity prices (LMPs) would increase substantially by the year 2032 due to the use of more expensive fuels (oil/coal) and lower efficiency generation units. While the grid MWh load growth from EVs and heat pump over the next 10 years will be only a modest 15% or so, the LMP would increase by 84%. The total annual cost for wholesale power supply for all customers in New England would increase from about \$3 billion to \$7 billion per year. All ratepayers in New England would collectively share the \$4 billion per year jump in wholesale power cost resulting from forecasted heat pump implementation.

The left graph in the next slide shows the expected increases in wholesale power costs (LMP = $ per MWh) in New England for the base case of no electrification (blue), then base + EVs (purple), then base + EVs + heat pumps (green). The right graph shows the expected total wholesale power costs paid by utility customers (LSEE = $ billion per yr).




The next and final slide shown here includes ISO New England commentary on the challenges of decarbonizing the grid when additional EV and heat pump loads are placed on top of the existing grid load profile.



MassDEP Clean Heat Standard

Annual CO2e Emissions by Single Family Homes in MA

Technical Notes by Raymond J. Albrecht PE

December 21, 2023

**Summary Biography for Raymond J. Albrecht PE**

Consulting environmental engineer with technical specialties in electric and fuel-fired heat pumps, solid biomass-fired heating systems, and liquid renewable fuels for 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). Principal of Raymond J. Albrecht LLC for the past 15 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 TECHNICAL NOTES**

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.

I then 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.

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.

<u>AVERT Model Results for Annual CO2e Emissions (US tons) by a Single-family Home in Massachusetts</u>

Figure 1 below shows AVERT model-based results for annual CO2e emissions by a representative single-family home in Massachusetts under different fuel and technology options that are feasible by the years 2030 and 2050. Massachusetts has approximately 2.6 million residential units plus a broad array of commercial, industrial and institutional buildings. Traditional fuel options include heating oil, propane 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, as well as air-to-water 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 is shown as a long-term goal, also presumes the availability of 720,000 MWh of battery storage to be sufficient for 48 hours of operation during periods of extreme cold temperature combined with low offshore wind and solar output.

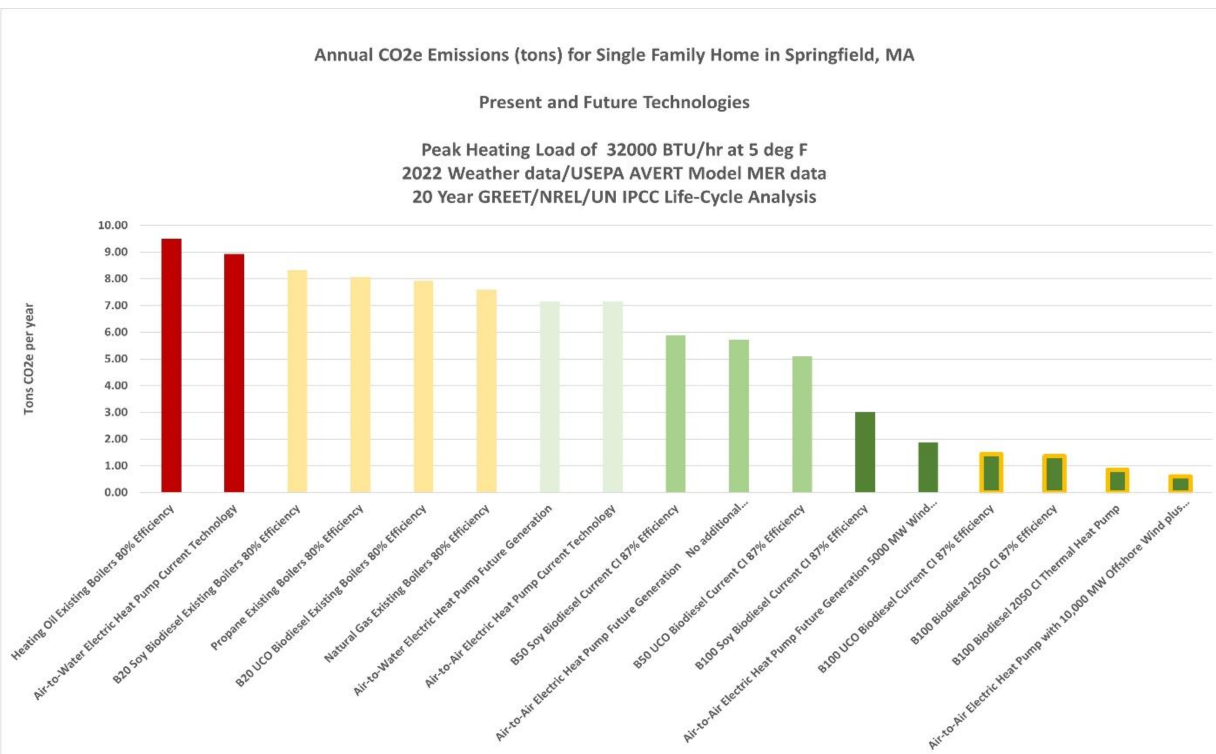



Figure 1. Annual CO2e Emissions (US tons) for a Representative Single Family Home in MA.

The two red-colored bars to the left in Figure 1 show traditional heating oil and current air-to-water heat pump technology as the highest emission options. The representative home would use approximately 600 gallons of oil for space heating plus an additional 200 gallons approximately for domestic hot water purposes. This analysis focuses, however, only on space heating. CO2e emissions for traditional heating oil would be something under 10 US tons (not metric tonnes) per year. Air-to-water heat pumps need to operate at higher supply temperatures than air-to-air heat pumps due to the requirements of hydronic distribution systems. They therefore experience approximately 20% lower efficiency than air-to-air heat pumps. This helps to explain why air-to-water heat pumps achieve only limited CO2e savings.

As illustrated by the four yellow-colored bars in the graph, CO2e savings in the range of 15 to 20 percent, compared to traditional heating oil, are achieved by propane, natural gas and B20 biodiesel blends, when life-cycle accounting is used for analysis.

Current air-to-air heat pump technology and future generation, improved air-to-water heat pump technology (see the light green bars in the middle of the graph) are shown as achieving 25 percent CO2e savings compared to traditional heating oil.

The options of B50 biodiesel blends and future air-to-air heat pump technology (see the medium green bars in the graph) are shown as achieving more significant CO2e savings in the range of 40 percent compared to traditional heating oil. The B50 soy-based option is somewhat higher in carbon intensity than the future generation air-to-air heat pump technology, while the B50 used-cooking oil (UCO) option is somewhat lower in carbon intensity. It is notable that the three options are closely similar in carbon intensity and are on a significantly faster trend toward carbon neutrality.

There is then a more substantial trend (see the dark green bars) toward declining CO2e emissions as biodiesel concentrations increase to the 100 percent level, and as dedicated, combined offshore wind plus utility-scale solar capacity growth to a total of 10,000 MW nameplate capacity is accomplished by Massachusetts, above and beyond the 40,000 MW nameplate capacity that is needed to decarbonize the existing New England grid. Dedicated offshore wind plus utility-scale solar capacity of 5,000 MW each, for a total of 10,000 MW, for Massachusetts, which represents about 50 percent of the 20,000 MW nameplate capacity ultimately needed for fully renewable heat pump operation, would achieve about 70 percent CO2e savings compared to heat pumps that use the existing grid.

The final four bars (dark green with gold borders) show a continuing downward trend in CO2e emissions as biodiesel achieves further improvements in feedstock production and processing (e.g., GPS-controlled planting and fertilizer application in agriculture, use of solar PV electricity in crushing operations, use of renewable methanol, etc.) as well as higher, end-use equipment efficiency (e.g., fuel-fired absorption heat pumps) for space heating in residential and commercial buildings. Absorption heat pumps can achieve efficiency levels of up to 140 percent, depending on manufacturing design and operating conditions. The final bar in the group shows estimated carbon intensity, based on data provided by the National Renewable Energy Laboratory (NREL), for heat pump operation when supplied with full capacity, solar and wind power.

Dedicated solar/wind power nameplate capacity of 20,000 MW for Massachusetts would provide for renewable heat pump utilization during the peak heating months of the winter but as previously described, would also require approximately 720,000 MWh of battery storage to maintain continued grid operation for up to 48 hours during cold weather combined with low wind and solar output conditions.

Alternatively, fully renewable heat pump operation could be accomplished in the near term through separate metering and billing for heat pumps, combined with power purchase agreements between electric utilities and solar/wind/battery projects which are dedicated exclusively to supply renewable electricity for space heating. Such bilateral agreements, if associated with renewable power generation capacity built above and beyond the requirements of MA RPS and Clean Energy Standard compliance obligations, could provide the additional benefit of reducing upward pricing pressure on wholesale electricity prices within the ISO New England market that would otherwise result from increased grid loads.

It should be noted that the previously described graph does not include possible hybrid heating systems consisting of renewable fuel-fired boilers and heat pumps. Smart controls for such hybrid systems could selectively operate individual components based on relative carbon intensity to achieve optimized environmental performance and to reduce grid load impacts. Smart controls could favor heat pump operation during mild weather and lower grid load periods (e.g., late evening, very early morning and mid-day hours) when heat pump and power generation efficiencies are higher. Likewise, smart controls could favor renewable fuel-fired boiler operation during cold weather, high grid load hours, and rapid, upward grid-load ramping periods (e.g., morning and late afternoon) when grid stability is under greatest stress. Smart controls could also base their decision making on relative carbon intensity of renewable fuels and grid electricity.

**REFERENCES USED IN PREPARATION OF TECHNICAL NOTES**

As the first step in preparation of these technical notes, 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.

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.

**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.

Figure 2 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.

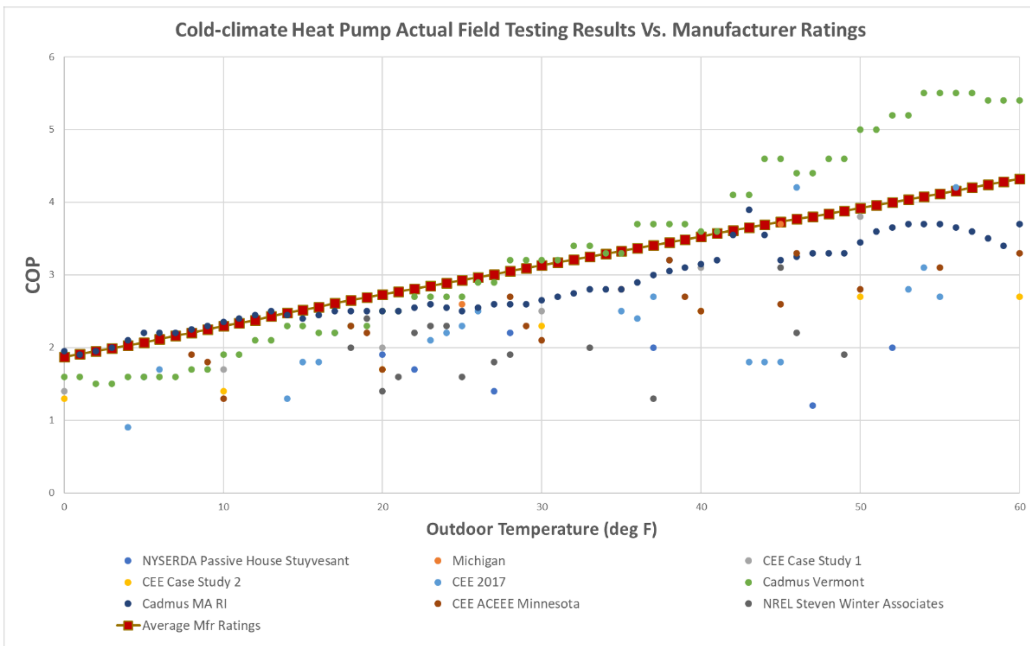



Figure 2.  Cold-climate Heat Pump Actual Field-Testing Results vs. Manufacturer Ratings

Figure 3 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.

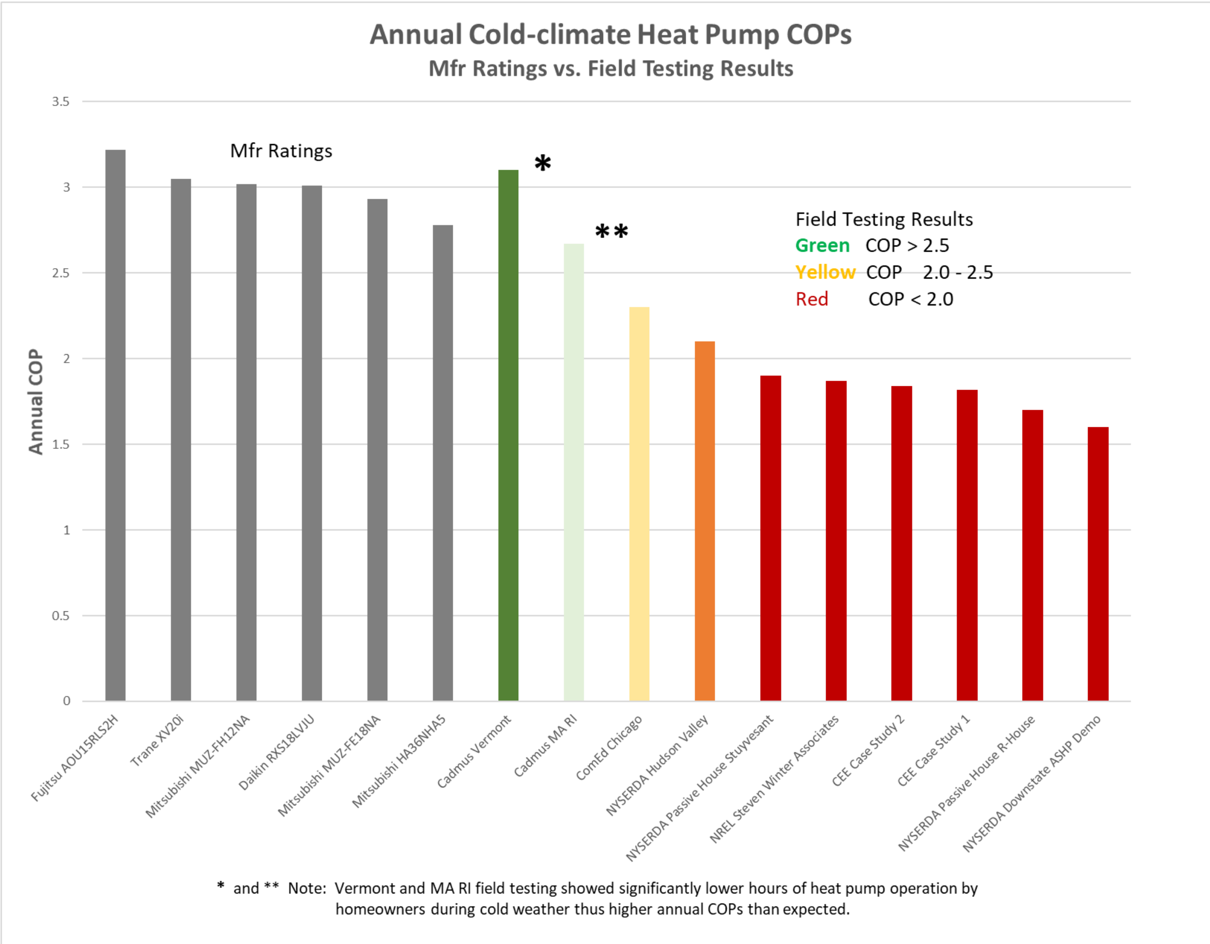



Figure 3. Annual Cold-climate Heat Pump COPs – Manufacturer Ratings vs. Field Testing Results

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.

**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 UN 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.

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, thus approximately 152 lb/MMBTU.

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 offshore wind likewise are sparse but indicate significant carbon content for fabrication and construction steps.

**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 4.1 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.

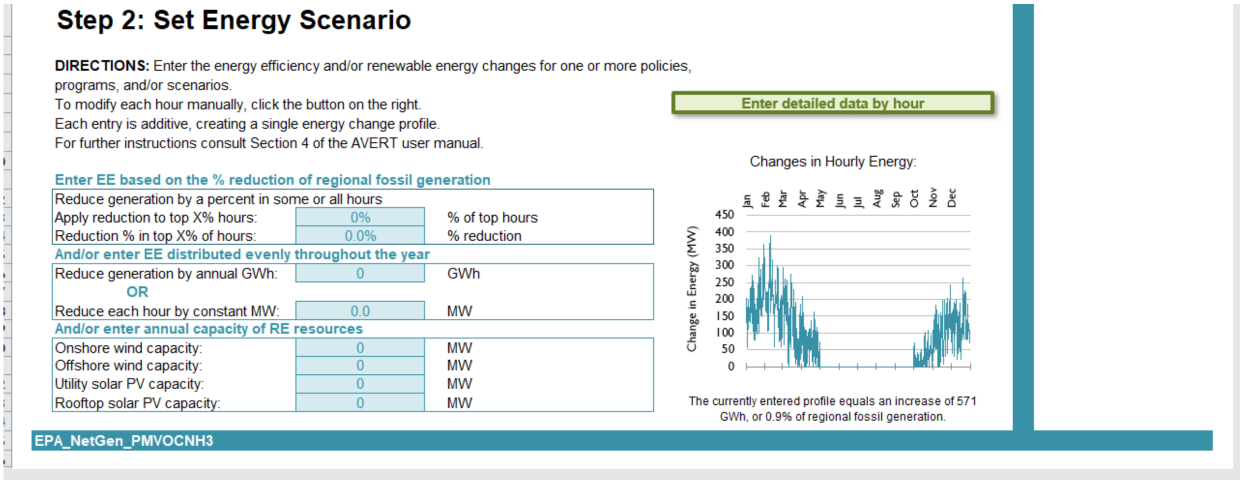



Figure 4. Example data input page for USEPA AVERT software

The screenshot shown above in Figure 4 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.

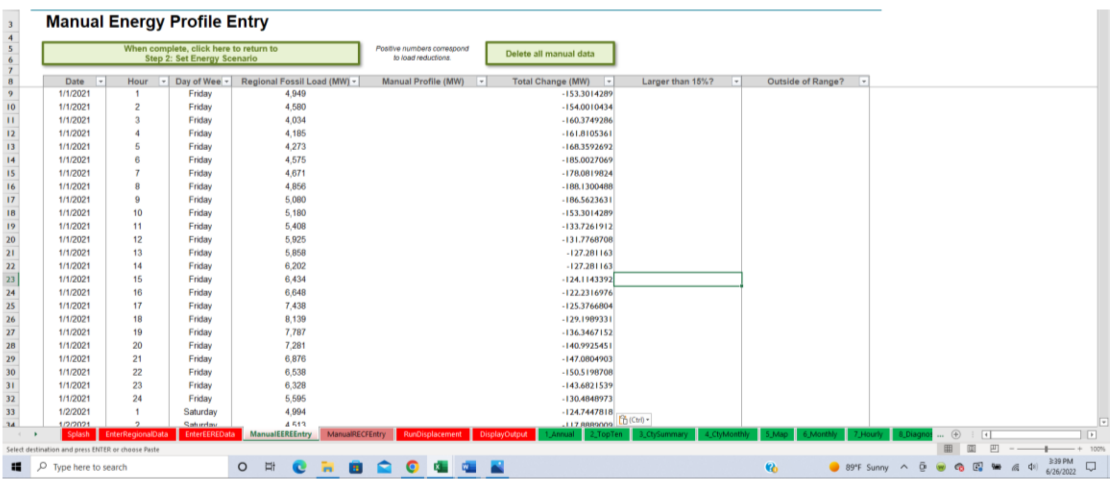



Figure 5. Example screenshot of USEPA AVERT software – manual input of grid load data

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 6. Example screenshot of AVERT summary output page showing annual generation and emissions impacts.

As shown in Figure 6 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 7. Example screenshot of AVERT output page showing hourly changes to individual power plant MW generation outputs

As shown in Figure 7 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.

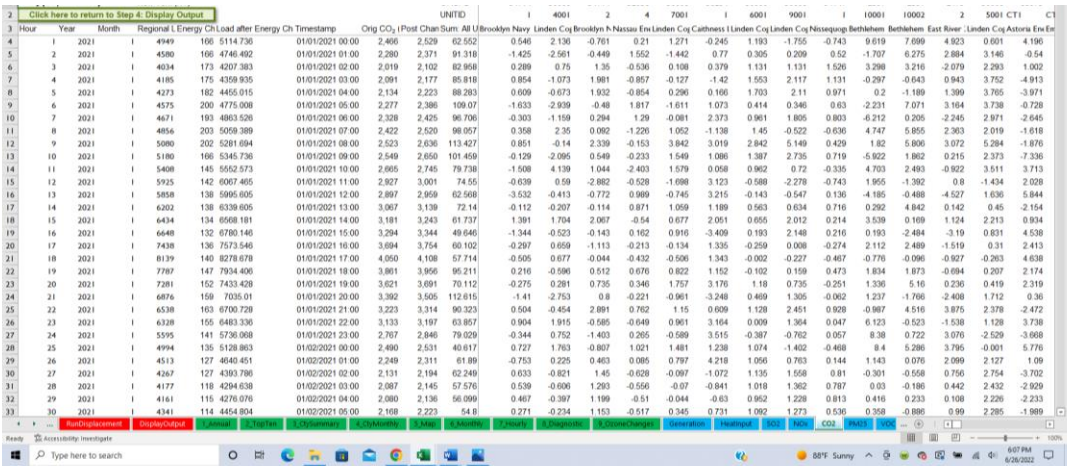



Figure 8. Example screenshot of AVERT output page showing hourly changes to individual power plant CO2 emission rates (lb/hr)

As shown in Figure 8 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.

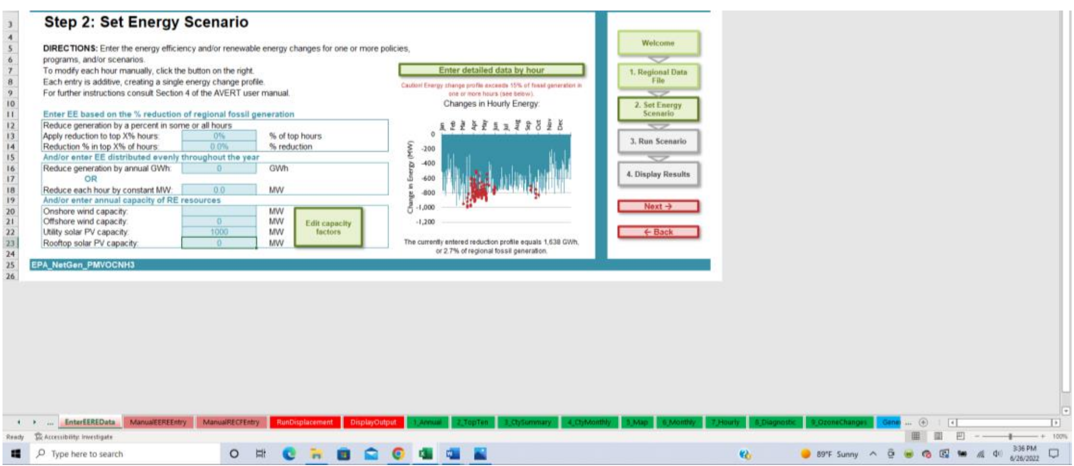
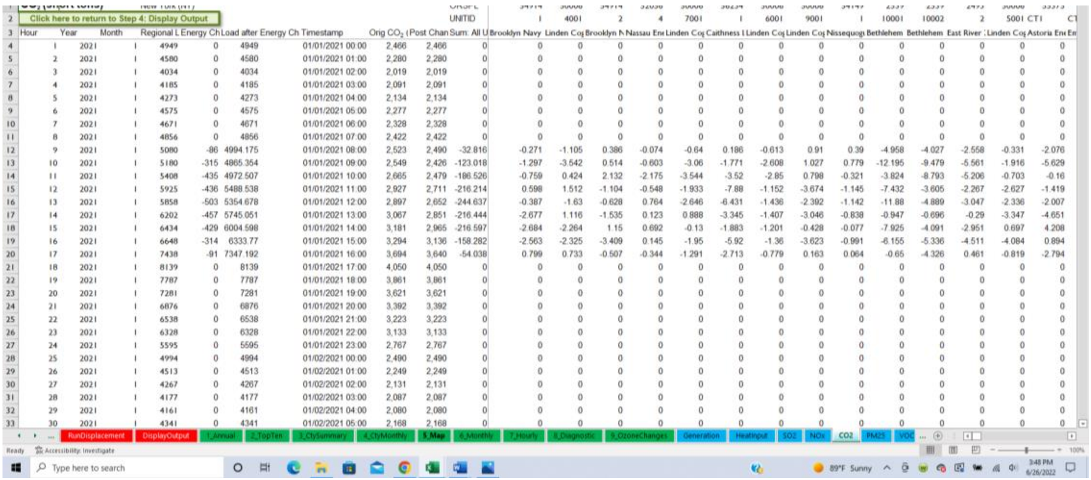



Figure 9. Example screenshot of AVERT input page showing MW quantities of renewable power generation capacity selected for analysis.

As shown in Figure 9 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.




| | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | | | | | | | | | UNITID | 1 | 4001 | 2 | 4 | 7001 | 1 | 6001 | 9001 | 1 | 10001 | 10002 | 2 | 5001 | CT1 | |
| 3 | Hour | Year | Month | Regional L | Energy Ch | Load after Energy Ch | Timestamp | Orig $CO_2$ ( | Post Chan | Sum: All U | Brooklyn Navy | Linden Co | Brooklyn N | Nassau En | Linden Co | Caithness I | Linden Co | Linden Co | Nissequog | Bethlehem | Bethlehem | East River | Linden Co | Astoria En |
| 4 | 1 | 2021 | 1 | 4949 | 0 | 4949 | 01/01/2021 00:00 | 2,466 | 2,466 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 5 | 2 | 2021 | 1 | 4580 | 0 | 4580 | 01/01/2021 01:00 | 2,280 | 2,280 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 6 | 3 | 2021 | 1 | 4034 | 0 | 4034 | 01/01/2021 02:00 | 2,019 | 2,019 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7 | 4 | 2021 | 1 | 4185 | 0 | 4185 | 01/01/2021 03:00 | 2,091 | 2,091 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 8 | 5 | 2021 | 1 | 4273 | 0 | 4273 | 01/01/2021 04:00 | 2,134 | 2,134 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 9 | 6 | 2021 | 1 | 4575 | 0 | 4575 | 01/01/2021 05:00 | 2,277 | 2,277 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 10 | 7 | 2021 | 1 | 4671 | 0 | 4671 | 01/01/2021 06:00 | 2,328 | 2,328 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 11 | 8 | 2021 | 1 | 4856 | 0 | 4856 | 01/01/2021 07:00 | 2,422 | 2,422 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 12 | 9 | 2021 | 1 | 5080 | -86 | 4994.175 | 01/01/2021 08:00 | 2,523 | 2,490 | -32.816 | -0.271 | -1.105 | 0.386 | -0.074 | -0.64 | 0.186 | -0.613 | 0.91 | 0.39 | -4.958 | -4.027 | -2.558 | -0.331 | -2.076 |
| 13 | 10 | 2021 | 1 | 5180 | -315 | 4865.354 | 01/01/2021 09:00 | 2,549 | 2,426 | -123.018 | -1.297 | -3.542 | 0.514 | -0.603 | -3.06 | -1.771 | -2.608 | 1.027 | 0.779 | -12.195 | -9.479 | -5.561 | -1.916 | -5.629 |
| 14 | 11 | 2021 | 1 | 5408 | -435 | 4972.507 | 01/01/2021 10:00 | 2,665 | 2,479 | -186.526 | -0.759 | 0.424 | 2.132 | -2.175 | -3.544 | -3.52 | -2.85 | 0.798 | -0.321 | -3.824 | -8.793 | -5.206 | -0.703 | -0.16 |
| 15 | 12 | 2021 | 1 | 5925 | -436 | 5488.538 | 01/01/2021 11:00 | 2,927 | 2,711 | -216.214 | 0.598 | 1.512 | -1.104 | -0.548 | -1.933 | -7.88 | -1.152 | -3.674 | -1.145 | -7.432 | -3.605 | -2.267 | -2.627 | -1.419 |
| 16 | 13 | 2021 | 1 | 5858 | -503 | 5354.678 | 01/01/2021 12:00 | 2,897 | 2,652 | -244.637 | -0.387 | -1.63 | -0.628 | 0.764 | -2.646 | -6.431 | -1.436 | -2.392 | -1.142 | -11.88 | -4.889 | -3.047 | -2.336 | -2.007 |
| 17 | 14 | 2021 | 1 | 6202 | -457 | 5745.051 | 01/01/2021 13:00 | 3,067 | 2,851 | -216.444 | -2.677 | 1.116 | -1.535 | 0.123 | 0.888 | -3.345 | -1.407 | -3.046 | -0.838 | -0.947 | -0.696 | -0.29 | -3.347 | -4.651 |
| 18 | 15 | 2021 | 1 | 6434 | -429 | 6004.598 | 01/01/2021 14:00 | 3,181 | 2,965 | -216.597 | -2.684 | -2.264 | 1.15 | 0.692 | -0.13 | -1.883 | -1.201 | -0.428 | -0.077 | -7.925 | -4.091 | -2.951 | 0.697 | 4.208 |
| 19 | 16 | 2021 | 1 | 6648 | -314 | 6333.77 | 01/01/2021 15:00 | 3,294 | 3,136 | -158.282 | -2.563 | -2.325 | -3.409 | 0.145 | -1.95 | -5.92 | -1.36 | -3.623 | -0.991 | -6.155 | -5.336 | -4.511 | -4.084 | 0.894 |
| 20 | 17 | 2021 | 1 | 7438 | -91 | 7347.192 | 01/01/2021 16:00 | 3,694 | 3,640 | -54.038 | 0.799 | 0.733 | -0.507 | -0.344 | -1.291 | -2.713 | -0.779 | 0.163 | 0.064 | -0.65 | -4.326 | 0.461 | -0.819 | -2.794 |
| 21 | 18 | 2021 | 1 | 8139 | 0 | 8139 | 01/01/2021 17:00 | 4,050 | 4,050 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 22 | 19 | 2021 | 1 | 7787 | 0 | 7787 | 01/01/2021 18:00 | 3,861 | 3,861 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 23 | 20 | 2021 | 1 | 7281 | 0 | 7281 | 01/01/2021 19:00 | 3,621 | 3,621 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 24 | 21 | 2021 | 1 | 6876 | 0 | 6876 | 01/01/2021 20:00 | 3,392 | 3,392 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 25 | 22 | 2021 | 1 | 6538 | 0 | 6538 | 01/01/2021 21:00 | 3,223 | 3,223 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 26 | 23 | 2021 | 1 | 6328 | 0 | 6328 | 01/01/2021 22:00 | 3,133 | 3,133 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 27 | 24 | 2021 | 1 | 5595 | 0 | 5595 | 01/01/2021 23:00 | 2,767 | 2,767 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 28 | 25 | 2021 | 1 | 4994 | 0 | 4994 | 01/02/2021 00:00 | 2,490 | 2,490 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 29 | 26 | 2021 | 1 | 4513 | 0 | 4513 | 01/02/2021 01:00 | 2,249 | 2,249 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 30 | 27 | 2021 | 1 | 4267 | 0 | 4267 | 01/02/2021 02:00 | 2,131 | 2,131 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 31 | 28 | 2021 | 1 | 4177 | 0 | 4177 | 01/02/2021 03:00 | 2,087 | 2,087 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 32 | 29 | 2021 | 1 | 4161 | 0 | 4161 | 01/02/2021 04:00 | 2,080 | 2,080 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 33 | 30 | 2021 | 1 | 4341 | 0 | 4341 | 01/02/2021 05:00 | 2,168 | 2,168 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Figure 10. Example screenshot of AVERT output page showing hourly values of solar power output plus impact on individual power plants.

As shown in Figure 10 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 2022 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 11 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.

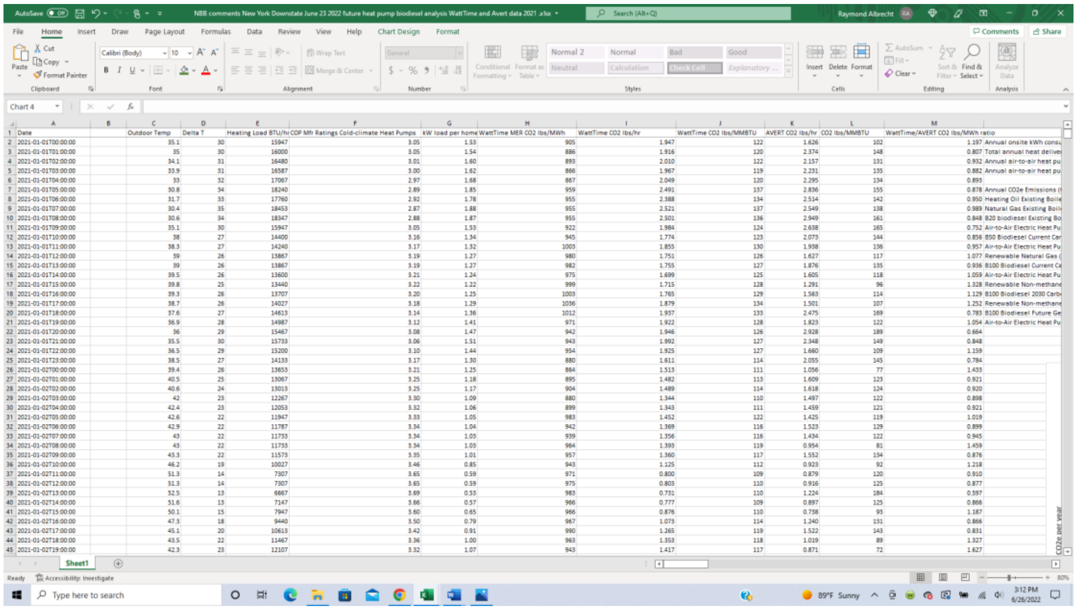


Figure 11. Screenshot of hourly heating system and power grid performance Excel analysis table.

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 12 below shows AVERT model results for annual CO2e emissions by a representative single-family home in Massachusetts under different fuel and technology options that are feasible by the years 2030 and 2050. Massachusetts has approximately 2.6 million residential units plus a broad array of commercial, industrial and institutional buildings. Traditional fuel options include heating oil, propane 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 as well as air-to-water 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 challenging to achieve by the year 2050, 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.

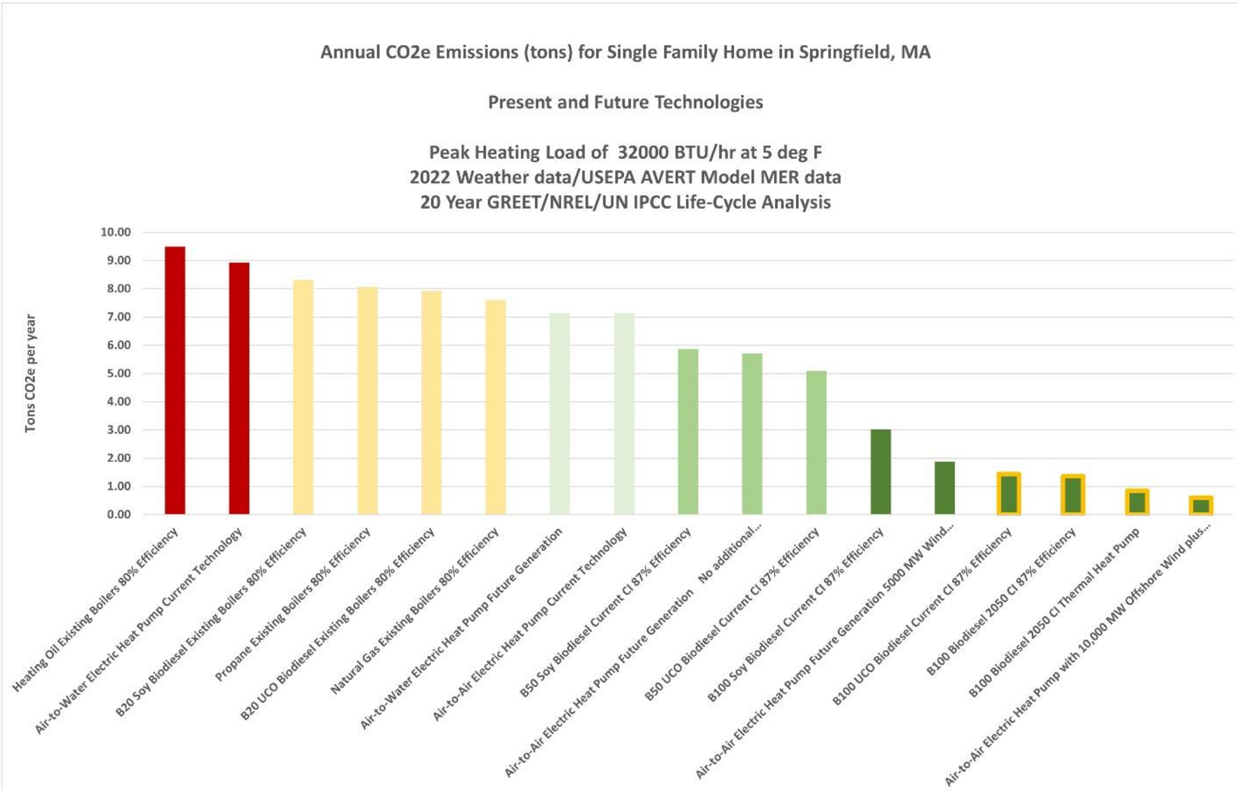



Figure 12. Annual CO2e Emissions for Single Family Homes in MA.

The two red-colored bars to the left in Figure 1 show traditional heating oil and current air-to-water heat pump technology as the highest emission options. The representative home would use approximately 600 gallons of oil for space heating plus an additional 200 gallons approximately for domestic hot water purposes. This analysis focuses, however, only on space heating. CO2e emissions for traditional heating oil would be something under 10 tons per year. Air-to-water heat pumps need to operate at higher supply temperatures than air-to-air heat pumps due to the requirements of hydronic distribution systems. They therefore experience approximately 25% lower efficiency than air-to-air heat pumps. This helps to explain why air-to-water heat pumps achieve only limited CO2e savings.

As illustrated by the four yellow-colored bars in the graph, CO2e savings in the range of 15 to 20 percent, compared to traditional heating oil, are achieved by propane and natural gas-fired boilers, current air-to-air heat pump technology and B20 biodiesel blends.

Current air-to-air heat pump technology and future generation, improved air-to-water heat pump technology (see the light green bars in the middle of the graph) are shown as achieving 25 percent CO2e savings compared to traditional heating oil.

The options of B50 biodiesel blends and future air-to-air heat pump technology (see the medium green bars in the graph) are shown as achieving more significant CO2e savings in the range of 40 percent compared to traditional heating oil. The B50 soy-based option is somewhat higher in carbon intensity than the future generation air-to-air heat pump technology while the B50 used-cooking oil (UCO) option is somewhat lower in carbon intensity. It is notable that the three options are closely similar in carbon intensity and are on a significantly more favorable trend toward carbon neutrality.

There is then a more substantial trend (see the dark green bars) toward declining CO2e emissions as biodiesel concentrations increase to the 100 percent level, and as dedicated, combined offshore wind plus utility-scale solar capacity growth to a total of 10,000 MW nameplate capacity is accomplished by Massachusetts, above and beyond the 40,000 MW nameplate capacity that is needed to decarbonize the existing New England grid. Dedicated offshore wind plus utility-scale solar capacity of 5,000 MW each, for a total of 10,000 MW, for Massachusetts, which represents about 50 percent of the 20,000 MW nameplate capacity ultimately needed for fully renewable heat pump operation, would achieve about 70 percent CO2e savings compared to heat pumps that use the existing grid.

The final four bars (dark green with gold borders) show a continuing downward trend in CO2e emissions as biodiesel achieves further improvements in feedstock production and processing (e.g., GPS-controlled planting and fertilizer application in agriculture, use of solar PV electricity in crushing operations, use of renewable methanol, etc.) as well as higher, end-use equipment efficiency (e.g., fuel-fired absorption heat pumps) for space heating in residential and commercial buildings. Absorption heat pumps can achieve efficiency levels of up to 140 percent, depending on manufacturing design and operating conditions. The final bar in the group shows estimated carbon intensity, based on data provided by the National Renewable Energy Laboratory (NREL), for heat pump operation when supplied with full capacity, solar and wind power.

Dedicated solar/wind power nameplate capacity of 20,000 MW for Massachusetts would provide for renewable heat pump utilization during the peak heating months of the winter but as previously described, would also require approximately 720,000 MWh of battery storage to maintain continued grid operation for up to 48 hours during cold weather combined with low wind and solar output conditions.

Alternatively, fully renewable heat pump operation could be accomplished in the near term through separate metering and billing for heat pumps, combined with power purchase agreements between electric utilities and solar/wind/battery projects which are dedicated exclusively to supply renewable electricity for space heating. Such bilateral agreements, if associated with renewable power generation capacity built above and beyond the requirements of MA RPS and Clean Energy Standard compliance obligations, could provide the additional benefit of reducing upward pricing pressure on wholesale electricity prices within the ISO New England market that would otherwise result from increased grid loads.

It should be noted that the previously described graph does not include possible hybrid heating systems consisting of renewable fuel-fired boilers and heat pumps. Smart controls for such hybrid systems could selectively operate individual components based on relative carbon intensity to achieve optimized environmental performance and to reduce grid load impacts. Smart controls could favor heat pump operation during mild weather and lower grid load periods (e.g., late evening, very early morning and mid-day hours) when heat pump and power generation efficiencies are higher. Likewise, smart controls could favor renewable fuel-fired boiler operation during cold weather, high grid load hours, and rapid, upward grid-load ramping periods (e.g., morning and late afternoon) when grid stability is under greatest stress. Smart controls could also base their decision making on relative carbon intensity of renewable fuels and grid electricity.

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 13 below 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.

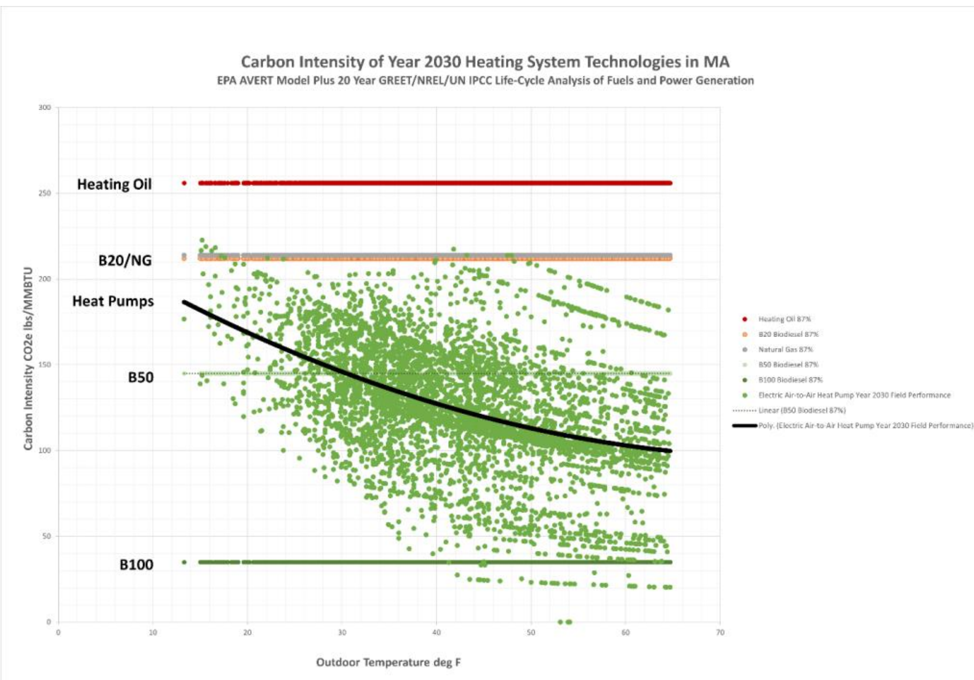



Figure 13. Carbon Intensity of Year 2030 Heating System Technologies vs. Outdoor Temperature

The graph in Figure 14 below 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.

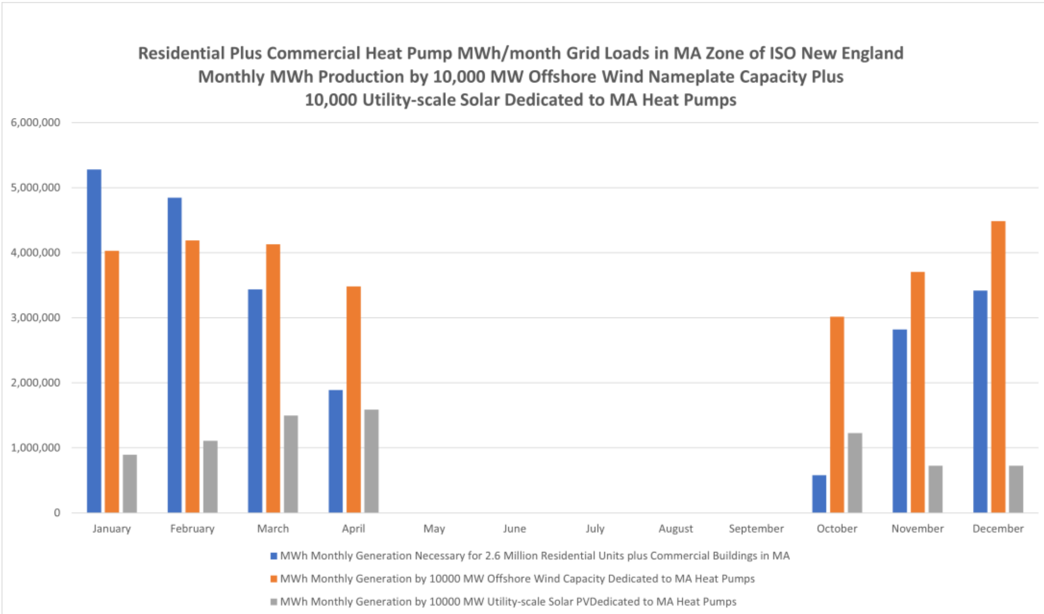



Figure 14. MA Monthly Grid Loads for Residential and Commercial Heat Pumps Plus 10,000 MW Wind Capacity Plus 10,000 MW Solar PV Nameplate Capacity

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.

**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.

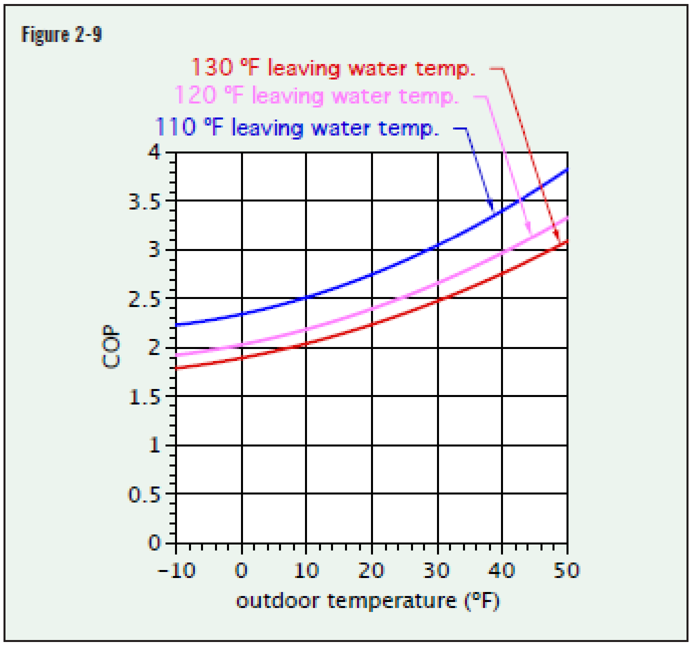



Figure 15. Example Manufacturer COP Rating Chart for Air-to-water Heat Pump

Figure 15 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 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.

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December 21, 2023

Bonnie Heiple, Commissioner
Massachusetts Department of Environmental Protection
100 Cambridge Street, Suite 900
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(Bonnie.Heiple@mass.gov)

**Re: Clean Heat Standard Draft Framework**

Dear Commissioner Heiple:

Ameresco, Inc. submits this comment in response to the November 2023 draft framework for a Clean Heat Standard issued by the Massachusetts Department of Environmental Protection ("MassDEP"). Ameresco is grateful for the opportunity to comment on the draft framework, and that MassDEP has been receptive to comments throughout this process, including Ameresco's previous comment submitted on May 1, 2023. In particular, Ameresco appreciates that the draft framework incorporates lifecycle greenhouse gas ("GHG") emissions reductions as a critical element for assessing the benefits of clean heating technologies. Yet Ameresco believes that the draft framework could be improved in several ways to enhance its effectiveness in replacing fossil heating sources with lower-carbon alternatives that are readily available now:

- The Clean Heat Standard should credit renewable natural gas ("RNG"), given its significant lifecycle GHG emissions reductions and attendant climate benefits. The draft framework credits electrification and certain liquid biofuels, and is even proposing standards for adding clean heating solutions based in part on assessing lifecycle GHG emissions reductions, yet, without explanation, it omits RNG, which would easily satisfy the draft framework's standards for determining when to include additional clean heat resources. RNG is also an abundant resource that is available now as a drop-in replacement to fossil natural gas in existing gas infrastructure. The Commonwealth should not delay in crediting RNG as a critical clean heat resource, consistent with its approach to crediting RNG under both the Renewable and Alternative Portfolio Standards and the approaches taken in other states, such as in California where the

California Public Utilities Commission recently set biomethane procurement targets for gas utilities to reduce "short-lived climate pollutant" emissions, *i.e.*, methane emissions.[1]

- The Clean Heat Standard should be technology-neutral. However, the draft framework currently omits a range of important technologies, such as RNG, weatherization/energy efficiency measures, clean hydrogen, and others, any of which could play a key role in decarbonizing building-sector heating along with electrification and liquid biofuels. Relying only on a small handful of solutions, especially at this critical juncture, runs the risk that those solutions fail to deliver immediate benefits or the complete range of needed climate benefits, and that other solutions will eventually need to be pursued to fill the gaps.

- MassDEP should not wait until the draft framework's 2028 program review to determine whether additional clean heating resources should be credited. Massachusetts has much to accomplish over the next five years to help prevent the worst effects of climate change. MassDEP should not tie its hands over the next half-decade if other solutions are needed or new technologies become available to achieve the Clean Heat Standard's aims in the nearer term. The draft framework should include a mechanism that allows MassDEP to add clean heat resources to the list of creditable technologies if they are shown to satisfy decarbonization requirements.

## About Ameresco

Ameresco is a leading global developer of renewable energy projects based in Framingham, Massachusetts. It operates several biogas projects in many states, including a landfill gas-to-energy facility (with 7.6 MW nameplate capacity) in Chicopee, Massachusetts that generates renewable electricity for the regional grid. A Clean Heat Standard that credits RNG will be critically important to decarbonizing building sector emissions while spurring investment in new RNG projects in the Commonwealth and elsewhere. Ameresco urges MassDEP to reconsider its draft Clean Heat Standard framework to include RNG and other technologies as creditable sources of clean heat, and to do so without delay so that the Commonwealth is best-positioned to immediately reduce building-sector GHG emissions and achieve its critical climate goals.

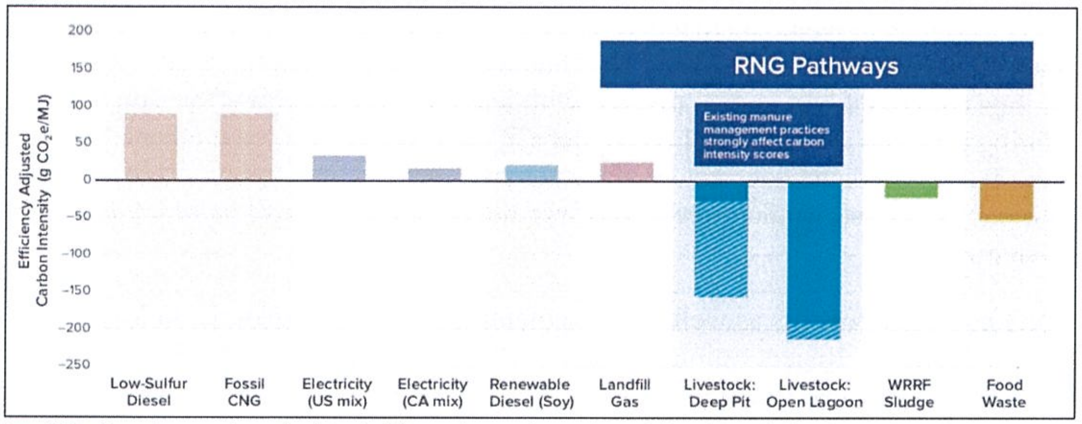
## Comments on the Draft Clean Heat Standard Framework

### I. The Clean Heat Standard Should Credit RNG.

MassDEP should credit RNG in the Clean Heat Standard given its significant lifecycle GHG emissions reductions relative to fossil alternatives, including natural gas and heating oil.

[1] California Public Utilities Commission, CPUC Sets Biomethane Targets for Utilities (Feb. 24, 2022), https://www.cpuc.ca.gov/news-and-updates/all-news/cpuc-sets-biomethane-targets-for-utilities.

RNG's lifecycle emissions reductions are significant. Current estimates show that RNG is among the most impactful biomass-based fuels in terms of reducing lifecycle GHG emissions[2]:




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)

RNG achieves GHG emissions reductions in two main ways that are essential to the Commonwealth's carbon reduction goals. First, RNG diverts methane from landfills, farming, and waste treatment facilities that may otherwise escape into the atmosphere and intensify climate change impacts. As MassDEP is aware, methane is a highly potent GHG compared to carbon dioxide even though it degrades more rapidly in the atmosphere.[3] Some estimates hold methane responsible for around 30 percent of the increased warming the planet is experiencing today.[4] Diverting methane from the atmosphere therefore is imperative, and RNG provides a critical solution for the Commonwealth to reduce methane emissions.

MassDEP has acknowledged this benefit in its previously published materials. Regarding diverting biogas generated from waste treatment, MassDEP has stated:

> The benefits of using biogas at WWTPs [waste water treatment plants] to produce energy are numerous. In addition to the cost savings associated with the transport and disposal of wastewater sludge, energy from biogas (as oppose[d] to electricity from the grid), can provide heat and power for use in the general operation of a WWTP. The environmental benefits of using biogas are also significant. Anaerobically treating wastewater sludge can significantly reduce the amount of

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[2] 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.

[3] *See* Massachusetts Clean Energy and Climate Plan for 2025 and 2030, at 88 n. 65 (June 30, 2022), *available at* https://www.mass.gov/doc/clean-energy-and-climate-plan-for-2025-and-2030/download ("Methane is estimated to have a global warming potential of 28–36 over 100 years, but a global warming potential of 84-87 (i.e., 84-87 times more potent than carbon dioxide) over 20 years.").

[4] International Energy Agency, *Methane and Climate Change*, https://www.iea.org/reports/global-methane-tracker-2022/methane-and-climate-change (last visited Dec. 21, 2023).

> methane (a powerful greenhouse gas) and other greenhouse gases that would otherwise be released to the atmosphere.[5]

RNG also puts biogenic methane to productive uses when it may otherwise be released directly into the atmosphere or flared off, and thus wasted, at the source. Even if methane is flared and thus converted into carbon dioxide with less acute, near-term effects on climate change, flaring provides no additional useful benefit (apart from avoided methane emissions). Importantly, flaring methane does not displace demand for fossil natural gas. Using RNG for clean heating, by contrast, would directly displace the demand for fossil natural gas in the heating system.

RNG has other benefits as well. It is a potentially abundant resource in Massachusetts and across the country.[6] Recent estimates suggest that RNG generated from biogas from anaerobic digestion sources (*e.g.*, landfills, agriculture, and waste digesters) could supply about 10 percent of residential demand, 11 percent of commercial demand, or 26 percent of industrial demand in Massachusetts.[7] Other estimates suggest that Massachusetts could increase its current biogas systems from between 30 and 40 to more than 120, which could result in significant GHG emissions reductions as well as economic opportunities, such as infrastructure investment and job creation.[8] RNG is a readily available resource for meeting the Commonwealth's clean heating needs but requires additional support to realize its full, untapped potential.[9]

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[5] MassDEP Fact Sheet, Biogas Production, at 4, *available at* https://www.mass.gov/doc/biogas-production/download (last accessed Dec. 21, 2023); *see also* S. Chai Wong (MassDEP), *Tapping the Energy Potential of Municipal Wastewater Treatment: Anaerobic Digestion and Combined Heat and Power in Massachusetts*, at 12 (July 2011), https://www.mass.gov/doc/tapping-the-energy-potential-of-municipal-wastewater-treatment-anaerobic-digestion-and-0/download ("The environmental benefit, which plants themselves may not be able to assess, arises from the diversion of methane for productive use. . . . [T]he active capture and use of methane from the breakdown of organic materials is especially important as a part of any greenhouse gas emission reductions program and can play a significant role in limiting global warming. This same logic is the basis for methane capture in landfills which already occurs in Massachusetts, but comparatively, methane capture through AD is more controlled and effective and therefore more environmentally beneficial.").

[6] MassDEP and DOER recognize this in their webpage entitled, "Anaerobic Digestion Case Studies," which gives examples in Massachusetts and elsewhere of agricultural, landfill, and wastewater treatment plants that are diverting methane from biogas and achieving GHG emissions reductions. *See* MassDEP/DOER, Anaerobic Digestion Case Studies, https://www.mass.gov/info-details/anaerobic-digestion-case-studies (last visited Dec. 21, 2023).

[7] *See* RNG Coalition, Comment Letter on Clean Heat Standard, at 9 (May 1, 2023), *available at* https://www.mass.gov/doc/clean-heat-standard-comments/download (citing American Gas Foundation, Renewable Sources of Natural Gas: Supply and Emission Reduction Assessment (Dec. 2019), *available at* https://gasfoundation.org/wp-content/uploads/2019/12/AGF-2019-RNG-Study-Full-Report-FINAL-12-18-19.pdf).

[8] *See* American Biogas Council, Biogas State Profiles, Massachusetts, https://americanbiogascouncil.org/resources/state-profiles/massachusetts/ (last visited Dec. 21, 2023).

[9] Including RNG in the Clean Heat Standard could reduce its costs relative to fossil natural gas. As the Masschusetts Department of Public Utilities ("DPU") observed, "RNG currently does not meet the Department's least-cost supply planning standards given the higher cost of RNG relative to pipeline gas. Given this, the inclusion of RNG supplies in an LDC's resource portfolio would violate our goal of providing gas service at the lowest possible cost." Order on Regulatory Principles and Framework, D.P.U. 20-80, at 68 (Dec. 6, 2023), *available at* https://fileservice.eea.comacloud.net/FileService.Api/file/FileRoom/18297602. More needs to be done to

RNG is also a drop-in fuel. It can be introduced into the existing gas infrastructure with virtually no upgrades. And, as one study has suggested, RNG is cost-competitive with other decarbonization solutions, including electrification, when it comes to reducing GHG emissions.[10] RNG can thus be introduced immediately to begin decarbonizing building-sector heating, while other solutions, such as electrification, are simultaneously being pursued. RNG can also provide significant long-term benefits for building-sector heating that cannot be easily electrified and will continue to rely on existing gas infrastructure. Gas infrastructure in the Commonwealth is expected to remain in service for years to come. RNG could be critical to decarbonizing buildings that continue to rely on that infrastructure well into the future.

The Department of Public Utilities recently recognized RNG's long-term benefits in its order on the future of natural gas in the Commonwealth:

> As the Commonwealth strives to achieve its 2050 climate targets, we envision that the long-term use of the natural gas distribution system generally will be limited to strategic circumstances where electrification is not feasible for all natural gas applications. For example, we recognize that some C&I customers require natural gas for process heat applications for which there are currently no electric-driven alternatives. It would therefore be necessary to make RNG and/or hydrogen available to this category of end-use customers.[11]

RNG is also included in both the Renewable Portfolio Standard ("RPS") and Alternative Energy Portfolio Standard ("APS") among several other "Eligible Biomass Fuels."[12] The Clean Heat Standard should be consistent with these other programs. Regulatory consistency is critical to maintaining a durable and effective Clean Heat Standard that achieves the Commonwealth's decarbonization goals by ensuring that RNG is supported similarly across multiple programs. This will allow RNG in Massachusetts to continue scaling as needed to meet the Clean Heat Standard's decarbonization objectives.

MassDEP should also follow the example of other states, such as California. In February 2022, the California Public Utilities Commission set procurement targets for biomethane as follows: (1) 17.6 billion cubic feet of biomethane by 2025; and (2) 72.8 billion cubic feet per year by 2030 (or about 12 percent of current residential and small business gas usage).[13] Of course, Ameresco understands that MassDEP does not directly regulate gas procurement, and that DPU recently issued an order indicating that it would not at this time modify its gas

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incentivize this important low-carbon resource so that it is competitive with fossil gas. Including it in the Clean Heat Standard could help make RNG a more competitive, lower-carbon alternative.

[10] American Gas Foundation, *Renewable Sources of Natural Gas: Supply and Emission Reduction Assessment*, at 61 (Dec. 2019), *available at* https://gasfoundation.org/wp-content/uploads/2019/12/AGF-2019-RNG-Study-Full-Report-FINAL-12-18-19.pdf.

[11] Order on Regulatory Principles and Framework, D.P.U. 20-80, at 70 (Dec. 6, 2023), *available at* https://fileservice.eea.comacloud.net/FileService.Api/file/FileRoom/18297602.

[12] 225 CMR 14.02 (RPS – Class I); 225 CMR 15.02 (RPS – Class II); 225 CMR 16.02 (APS).

[13] California Public Utilities Commission, CPUC Sets Biomethane Targets for Utilities (Feb. 24, 2022), https://www.cpuc.ca.gov/news-and-updates/all-news/cpuc-sets-biomethane-targets-for-utilities.

procurement policies to require including RNG because of cost concerns.[14] However, MassDEP can contribute to reducing those costs by incorporating RNG into the Clean Heat Standard. And in any event, the reason the California Public Utilities Commission gave for incorporating RNG are the same ones that supporting including RNG in the Clean Heat Standard:

> Renewable gas procurement will reduce otherwise uncontrolled methane and black carbon emissions in our waste, landfill, agricultural and forest management sectors. These sectors are responsible for more than 75 percent of the state's methane emissions, according to California Air Resources Board 2019 data. Reducing SLCPs [short-lived climate pollutants], which are a far more potent greenhouse gas than carbon dioxide, is one of the most effective ways to slow the pace of climate change.[15]

RNG, with its existing climate benefits, ready availability, and capability of being deployed immediately in existing infrastructure, will be essential to meeting the Commonwealth's climate goals. MassDEP should revise the draft Clean Heat Standard framework to credit RNG.

## II. The Clean Heat Standard Should be Technology-Agnostic.

MassDEP must adopt a technology-agnostic Clean Heat Standard that credits additional clean heating solutions. The draft framework is incredibly narrow. It credits only certain electrification projects and certain liquid biofuels. Full electrification credits are further limited to residences that install electric heat pumps capable of meeting 100 percent of space heating needs. Other solutions are needed, such as RNG, weatherization and energy efficiency measures, and clean hydrogen, among others, which the Clean Heat Standard omits. The Clean Heat Standard should accommodate more renewable technologies that can move the Commonwealth closer to its decarbonization goals and address the full spectrum of building-sector heating emissions. Customers will then be able to choose among the full range of renewable clean heating technologies that fit their specific needs while reducing carbon emissions in line with the Commonwealth's goals.

The draft framework's narrow focus runs several risks. The Clean Heat Standard sets aggressive heat pump installation targets: 20,000 full electrifications in 2026; 40,000 in 2027; 60,000 in 2028; 80,000 in 2029; and 100,000 in 2030 and years thereafter.[16] Yet recent reporting suggests that heat pump installations are already falling behind other targets:

> The state is off to a slow start in installations of electric heat pumps. The state's climate plan calls for putting them in at least 100,000 homes by 2025, and at least

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[14] Order on Regulatory Principles and Framework, D.P.U. 20-80 (Dec. 6, 2023), *available at* https://fileservice.eea.comacloud.net/FileService.Api/file/FileRoom/18297602.

[15] California Public Utilities Commission, CPUC Sets Biomethane Targets for Utilities (Feb. 24, 2022), https://www.cpuc.ca.gov/news-and-updates/all-news/cpuc-sets-biomethane-targets-for-utilities.

[16] MassDEP Clean Heat Standard Draft Framework at 2.

> 500,000 homes by 2030. But over the last three years, there were about 30,000 new installations, which brings the state about 30% of the way to its 2025 target.[17]

High costs could be playing a role in the slow pace of heat pump installations, even with existing incentives. MassCEC estimates that, for a 2,000 square foot home, the up-front costs of installing an air-source heat pump system are $25,000, or $12,000 after existing Mass Save and other state and federal incentives are applied.[18] For ground-source heat pump systems, the estimated up-front costs are higher: $45,000, or $18,500 with existing state and federal incentives.[19] If the pace of installations does not meet MassDEP's targets, other solutions will be needed.

Electrification also may not work for many residential customers. And there is only so much a Clean Heat Standard can do to convince customers to switch to heat pumps. As MassDEP noted in its Frequently Asked Questions document: "Because [energy providers] cannot force people to convert to clean heat, the only way for them to ensure compliance is to motivate potential customers by lowering prices and providing other incentives, such as low-cost service contracts in exchange for the ability to claim [Clean Heat Credits] associated with the project."[20] Yet customers may choose not to make the switch despite the rebates and other incentives. Massachusetts needs a plan for those customers. That plan must include low-carbon alternatives apart from heat pumps and biodiesel blends.

The framework is unnecessarily limited in other ways. As Ameresco asserted in its previous comment letter, the Clean Heat Standard should also credit weatherization and energy efficiency measures. The framework explicitly excludes those measures to avoid "unnecessary complexity and redundancy with the Mass Save program."[21] MassDEP should reconsider that exclusion for at least the following reasons:

- First, weatherization and energy efficiency measures have been shown to have significant GHG emissions reductions impacts by curbing fossil fuel use. The International Energy Agency has stated that if all cost-effective energy efficiency measures based on existing technology were implemented worldwide, the result would be a reduction in annual energy-related emissions equal to over 40 percent "of the abatement required to be in line

[17] M. Wasser, Mass. Is on Track to Meet Its Near-term Climate Goals, But the Hardest Work Lies Ahead (Dec. 1, 2023), https://www.wbur.org/news/2023/12/01/report-card-climate-change-clean-energy-heat-pumps-ev-emissions.

[18] Massachusetts Clean Energy Center, *Air-source Heat Pumps*, https://goclean.masscec.com/clean-energy-solutions/air-source-heat-pumps (last visited Dec. 21, 2023).

[19] Massachusetts Clean Energy Center, *Ground-source Heat Pumps*, https://goclean.masscec.com/clean-energy-solutions/ground-source-heat-pumps/ (last visited Dec. 21, 2023).

[20] MassDEP, Clean Heat Standard (CHS), Stakeholder Process, Frequently Asked Questions (FAQ) Version 1.1, at 3 (Dec. 2023), https://www.mass.gov/doc/chs-faq/download.

[21] MassDEP Clean Heat Standard Draft Framework at 5.

with the Paris Agreement."[22] Energy efficiency measures are critically important to the Massachusetts' decarbonization goals and should be further incentivized.

- Second, MassDEP should not be concerned with redundancy. MassDEP has proposed elsewhere in the draft framework that the Clean Heat Standard would be "inclusive of clean heat supported by other programs, such as federal tax credits. In other words, all clean heat that meets program requirements would count toward achievement of the standards regardless of whether it is supported by other programs."[23] That should apply equally to weatherization and energy efficiency projects supported by Mass Save. Including those projects would also promote consistency across regulatory programs, which has significant benefits as noted above regarding the consistent treatment of RNG.

- Third, crediting weatherization and energy efficiency need not be "unnecessary[ily] complex[]." MassDEP can determine whether such projects qualify for emissions reduction credits based on reductions in energy use. Companies providing weatherization and energy efficiency services for buildings are capable of calculating energy savings from their projects. Those calculations could support Clean Heat Standard crediting. Alternatively, equivalency values could be developed, similar to those proposed for full electrification or hybrid electrification projects.

Finally, the framework needlessly limits eligible biofuels: "Eligible waste-based liquid biofuels would be credited based on the assumed avoidance of all emissions from combustion of an equivalent quantity of heating oil. Other liquid biofuels eligible for the federal Renewable Fuel Standard [RFS] would receive half credit through 2030 only."[24] MassDEP should reconsider this approach as well. RFS-eligible fuels should be credited as the framework proposes for other liquid biofuels, based on avoided emissions. Moreover, the 2030 cutoff is arbitrary, particularly given the recognized long-term value of biomass-based fuels for difficult-to-electrify resources. And finally, the reference to the RFS lends further support to Ameresco's assertion that gaseous biofuels, such as RNG, should be included. RNG is currently credited under the RFS as a renewable transportation fuel.[25] RNG derived from certain biomass feedstocks qualifies as a cellulosic biofuel, meaning that it is certified as reducing GHG emissions by at least 60 percent relative to the applicable fossil baseline, which is the RFS program's highest tier for low-carbon transportation fuels.[26] If the Clean Heat Standard credits those reductions for liquid biofuels, it should do the same for gaseous biofuels, such as RNG. MassDEP should avoid the arbitrary exclusion of RNG in favor of including other kinds of RFS-eligible renewable fuels, some of which have less favorable lifecycle GHG emissions reductions.

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[22] International Energy Agency, Emissions Savings, https://www.iea.org/reports/multiple-benefits-of-energy-efficiency/emissions-savings (last visited Dec. 21, 2023).

[23] MassDEP Clean Heat Standard Draft Framework at 2.

[24] *Id.* at 6.

[25] *See* 40 CFR 80.1426, Tbl. 1, Rows Q and T.

[26] *See id.*, Row Q. RNG from non-cellulosic sources is credited as "advanced" renewable fuel, which means it must achieve at least a 50 percent reduction in lifecycle GHG emissions relative to a fossil baseline. *See id.* Row T.

## III. MassDEP Should Not Wait Until 2028 to Determine Whether to Credit Additional Clean Heat Resources.

MassDEP's Clean Heat Standard should also include a mechanism for adding clean fuels that are shown to reduce lifecycle GHG emissions. It should revise the current proposal, which would require MassDEP to wait until a 2028 program review to revisit whether other clean fuels should be credited.

As the Commonwealth's new Climate Chief has stated, the threats from climate change are incredibly urgent in Massachusetts and across the country and the world: "In the ten months since the Healey-Driscoll Administration began, the urgency of reducing greenhouse gas emissions has only increased."[27] She observed that, "[t]o fulfill this historic opportunity to lead on climate, Massachusetts must act with far greater urgency and our efforts must be better coordinated."[28]

The Commonwealth cannot afford to lose the momentum that is driving its shift to lower-carbon energy sources. At this critical juncture, the Commonwealth does not have time to test certain climates solutions for a few years before evaluating others. MassDEP should be encouraging all low-carbon technologies and bolstering innovation in clean heating solutions to begin reducing carbon in myriad ways using several existing and emerging resources. Any delay risks omitting critical solutions that could be important to the Commonwealth's decarbonization goals, including reducing GHG emissions by 33 percent below 1990 levels by 2025 and 50 percent by 2030, especially if the Commonwealth is unable to meet its building-sector heating goals by relying only on electrification projects and biodiesel.[29]

Few clean fuel standards include this lengthy waiting period to incorporate additional low-carbon resources. The RFS, for example, establishes pre-approved fuel production pathways *as well as* a company-specific petition process, so that additional fuels can be added on an ongoing basis if they are shown to meet the RFS's lifecycle GHG emissions reduction requirements.[30] California's Low Carbon Fuel Standard also includes similar mechanisms for incorporating additional low-carbon fuels on an ongoing basis, rather than waiting for a program-wide evaluation period.[31]

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[27] M. Hoffer, Recommendations of the Climate Chief Pursuant to Section 3(b) of Executive Order No. 604, at 4 (Oct. 25, 2023), *available at* https://www.mass.gov/doc/recommendations-of-the-climate-chief-october-25-2023/download.

[28] *Id.* at 6.

[29] Executive Office of Energy and Environmental Affairs, Determination of Statewide Greenhouse Gas Emissions Limits and Sector-specific Sublimits for 2025 and 2030, at 1 (June 30, 2022), *available at* https://www.mass.gov/doc/2025-and-2030-ghg-emissions-limit-letter-of-determination/download.

[30] *See* 40 CFR 80.1416 (setting out the process for parties to petition EPA to allow them to participate in credit generation for transportation fuels derived from renewable biomass under the federal RFS).

[31] *See* California Air Resources Board, *Apply for LCFS Fuel Pathway*, https://ww2.arb.ca.gov/resources/documents/apply-lcfs-fuel-pathway (last visited Dec. 21, 2023) (explaining the process for applying for new low-carbon transportation fuel pathways under California's low carbon fuel standard).

Regarding whether to expand eligibility to other fuels, MassDEP should prioritize lifecycle GHG emissions reductions over other factors. MassDEP's framework identifies two other criteria: (1) fuel availability; and (2) local air pollution impacts. Regarding fuel availability, while important, this should not be a key consideration. The goal of the Clean Heat Standard should be, in addition to achieving GHG emissions reductions, promoting the development and scaling up of new and innovative decarbonization technologies for building-sector heating. Those solutions may not be as "available" compared with other alternatives under such a standard.[32] Nonetheless, if they are shown to be effective at reducing GHG emissions in the heating sector, they should be credited. Regarding local air pollution impacts, Massachusetts already aggressively regulates air pollution through extensive emissions controls and permitting. MassDEP should not exclude fuels that are produced in compliance with Massachusetts' existing, stringent air pollution requirements.

* * *

Ameresco strongly supports reducing building-sector GHG emissions through a Clean Heat Standard. But the Clean Heat Standard needs to be as inclusive as possible of the full range of available clean heating solutions to ensure that its ambitious climate goals are achieved. To do this, MassDEP must revise its draft framework to include RNG as a creditable clean fuel, make the Clean Heat Standard technology-agnostic, and give itself flexibility to add creditable clean heating resources to the Clean Heat Standard on an ongoing basis, as other similar programs, such as the federal RFS and California LCFS, are structured. Ameresco thanks MassDEP for its attention to this comment.

Respectfully,

Michael T. Bakas
Executive Vice President
Ameresco, Inc.

[32] In any event, RNG, for example, is readily available, as discussed above. *See supra* at 4.

December 20, 2023

**RE: American Biogas Council's Comments on MassDEP's Clean Heat Standard Framework**

The American Biogas Council (ABC) appreciates the opportunity to comment on the Massachusetts Department of Environmental Protection (MassDEP) proposed Clean Heat Standard framework. As a representative body for the U.S. biogas industry, we are committed to supporting the Commonwealth's decarbonization goals while advocating for the inclusion of viable, low-carbon fuels such as Renewable Natural Gas (RNG), Hydrogen, and other advanced heating fuels derived from biomass.

While we commend the Commonwealth's commitment to decarbonizing space heating, the proposed framework lacks meaningful incentives for suppliers to provide low-carbon fuels to the Commonwealth, it lacks sound science with respect to producing and tracking carbon reduction, and generally falls short of creating a technology-neutral, market driven mechanism that has proven successful in other states and other sectors.

The ABC is the voice of the US biogas industry dedicated to maximizing carbon reduction and economic growth using biogas systems. We represent over 400 companies in all parts of the biogas supply chain, leading the way to a low-carbon future, maximizing all the positive environmental and economic impacts biogas systems offer when they recycle organic material into renewable energy and soil products.

After reviewing the proposed framework, the ABC offers the following initial thoughts and recommendations:

*The Standard*

As proposed, the annual emission reduction standard is a gross tonnage of carbon dioxide equivalents, with no reference to a comparative emission inventory nor a proposed methodology for calculating the reduction. Taking this approach can produce several predictable and undesired outcomes, which are captured in part below:

- The lack of comparative emission inventory means that the Commonwealth cannot clearly demonstrate the progress that any emission reduction has achieved through a Clean Heat Program. As proposed, it is assumed the drafters set the 2045, 20 million metric ton (MMT) target relative to a historic inventory it set to eliminate, potentially a 2010 baseline for the State's building sector emissions.[1] This approach, however, assumes that energy consumption, economic growth, and the shift of energy supplies remain stagnant relative to that baseline. A better measure of progress is establishing a target based on the current emission inventory, such as a percentage reduction for a given period, either annual or otherwise. This ensures that overall sector emissions are reduced, rather than relying solely on the success of an intra-year target, which would likely produce a false dataset of emission reduction. If a gross emission reduction is utilized, it should be constructed as a relative % of the known emissions at the time of compliance (example: 2027 target requiring a 10% reduction over 2026's inventory)
- A much better approach than a gross emission reduction is establishing a target for Carbon Intensity (CI) of the heating fuel supply delivered to the sector. This approach considers the variability of energy sources and changing demand and allows for a simple and effective emission reduction calculation. Similar, successful approaches have been deployed effectively for vehicle transportation fuels, where the CI of the fuel delivered to the vehicle is the primary metric by which all other program details are aligned. An approach based upon CI also encourages fuel suppliers to innovate, to reduce the carbon emission profile of their product to maintain relevance to the market. Most importantly, this results in more energy sources available to Commonwealth as it decarbonizes. A CI-based target can be reduced over time and, as such, will naturally segregate fuels that can no longer meet the standard but allow technology to innovate with that constraint in mind, resulting in a technology-neutral approach that helps manage cost and reliability concerns often present during decarbonization transitions.
- The Full Electrification standard, requiring a set number of households to be electrified by obligated parties is likely to disincentivize heating suppliers to participate in the market, as they have no economic interest in electrified

[1] https://www.mass.gov/doc/ma-2050-decarbonization-roadmap/download

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homes, nor tangible means to effect change or limit impact to their business, it is all penalty and zero reward. Even in extreme examples where penalties, like fees or taxes, are levied against market participants, those market players still have options to improve performance to reduce the scope and scale of those impacts. Here, the proposed electrification standard only levies the penalty and offers no recourse to obligated parties to achieve the same or better performance on behalf of the Commonwealth. The result is that non-electric heating energy providers are incentivised instead to avoid the penalty altogether and exit the market, resulting in fewer electrification projects and energy sources overall, further exacerbating reliability and cost concerns.

*Regulated Heating Energy Suppliers*

As proposed, the framework pulls in electricity suppliers as regulated parties, which is counterproductive to the goals of the proposal for the following reasons:

- Electricity providers are being asked to expand their systems capabilities, as the proposal sets goals to electrify more buildings, requiring new investments in generation capacity, transmission, and distribution infrastructure. The costs of these investments will be borne by the electricity suppliers' customers, resulting in cost increases.
- The proposed emission reduction standard does not adequately address the constraints on the electricity providers as their delivered energy increases. As noted elsewhere, the proposal penalizes the supplier for the program's success rather than incentivizing them as partners. Here, the proposal assigns these suppliers a larger share of the compliance burden as the other energy providers exit the market.
- Electricity suppliers are, presumably, already meeting the goals of the proposed standard by providing electricity-based heating energy to the building sector. The proposed standard(s) result in an unnecessary penalty and cost being applied to a provider that should already be aligned with the direction and goals of the Commonwealth.
- Decarbonizing electricity provided to the building sector, as a complementary effort to the Clean Heat framework, should be managed by existing programs, including but not limited to the already established Renewable Portfolio Standard and Energy Efficiency programs.

*Credit Generation*

The framework suggests credit generation mechanisms that fail to produce meaningful, verifiable carbon reductions and disincentivize market participation in the following ways:

- The credit generation mechanism for electrification projects assumes that a home, regardless of energy consumption, fuel type, size, or location, equates to 5 metric tons (MT) of emission reduction. This assumption ignores carbon accounting standards, and broadly misrepresents the potential achievements of the standard. This approach also ignores the fact that there are specific projects that should be prioritized to achieve greater emission reduction and those that can be verified.
- The credit mechanism ignores combustion-based energy sources, even though some supplies can be certified and recognized as delivering carbon reduction.
- Emission reduction credits for alternative fuels, which are not proposed until 2028, should be considered at the program's outset. A delay until 2028 disincentivizes fuel producers, market buyers, and infrastructure investment, only to call upon them years later should the early execution of the program falter. Letting these fuels be evaluated earlier in the program can offer market-ready energy and early emission reductions.
- Discounting certain fuels and lower carbon pathways, arbitrarily, by as much as 50%, is not based in sound, standardized carbon accounting. In many cases, for example, partial electrification may or may not produce a 50% carbon emission reduction. If a primary heating source or heating fuel is replaced, the consumption associated with that unit is often assumed to be greater than 50% of a home's total energy consumption.
- Contradictions that exist within existing Massachusetts Alternative Portfolio Standards should be addressed. Allowing certain feedstocks to qualify if they produce electricity but not if delivered directly as heating fuel ignores the basic efficiency losses that occur when generating and distributing electricity. This requires greater use of these fuels across the Commonwealth, which can result in fewer realized emission reductions. For example, RNG can be used for electricity generation at an overall efficiency of only 40%, or it can be delivered directly to the consumer at an efficiency of over 90%. Delivering to generation may be appropriate in certain circumstances, but "wastes" the greenhouse gas emission reductions by requiring more overall consumption than necessary to produce the same energy delivered.
- Assigning credits to property owners is a cumbersome departure from standardized processes in similar markets throughout the country. Asking property owners to monetize credits in the open market forces the average consumer to develop a technical knowledge of credit value, or forgo the process entirely to avoid this administrative burden.

Overall, the capabilities of a clean heat standard to produce emission reductions in the building sector is significant. However, the proposed framework should incorporate mature and emerging policies in other states and other sectors, including clean fuel standards and other clean heat standards. The standard conceptual framework of a clean heat standard mimics that of a clean fuels standard, which utilizes a CI-based target, is fuel-neutral, and market based. This approach leverages full lifecycle emissions analysis for every fuel, electric, liquid, or gas. By reducing the overall carbon intensity of the energy supply utilized for heat in the Commonwealth, the average homeowner is unburdened by this change. They are not forced to modify their home appliances or negotiate the sale of their credits. As with any major policy, recognizing implementation barriers associated with consumer adoption and impact is essential and should be considered in the framework.

Additionally, this framework should more fully consider how it can serve adjacent climate-friendly policies in Massachusetts, including organic waste diversion. According to ABC's industry data[2], Massachusetts has nearly 2.5 million pounds of organic wastes to process and ideally recycle, with potential for 123 biogas systems to aid in those goals. Simultaneous to recycling, these systems can contribute over $360 million in capital and enough annual, renewable low carbon energy to heat over 200,000 homes if allowed to participate.

We urge the authors of this framework to adopt a multi-faceted approach that recognizes the diverse contributions of alternative fuels. Our policy team is prepared to engage with MassDEP to ensure the incorporation of the best solutions for residents.

Thank you for considering our comments, and we look forward to further collaboration.

Sincerely,

Patrick Serfass
Executive Director

### *About the American Biogas Council*

The American Biogas Council is the voice of the US biogas industry dedicated to maximizing carbon reduction and economic growth using biogas systems. We represent over 400 companies in all parts of the biogas supply chain who are leading the way to a better future by maximizing all the positive environmental and economic impacts biogas systems offer when they recycle organic material into renewable energy and soil products. Learn more online at www.AmericanBiogasCouncil.org, Twitter @ambiogascouncil, and LinkedIn.

[2] https://americanbiogascouncil.org/resources/state-profiles/massachusetts/

AMERICAN PUBLIC GAS ASSOCIATION

December 21, 2023

*Submission via email: [climate.strategies@mass.gov](mailto:climate.strategies@mass.gov)*

**Re: Massachusetts Clean Heat Standard**

Dear MassDEP:

The American Public Gas Association (APGA) is pleased to provide input informing the development of a Massachusetts Clean Heat Standard (CHS). APGA is the trade association for approximately 1,000 communities across the U.S. that own and operate their retail natural gas distribution entities, including Holyoke Gas and Electric, Westfield Gas and Electric Light Department, Wakefield Municipal Gas and Light, and Middleborough Gas and Electric in Massachusetts. They are not-for-profit and locally accountable to the citizens they serve, providing safe, reliable, affordable, and efficient energy to their customers. They support their communities by delivering fuel to be used for cooking, clothes drying, and space and water heating, as well as for various commercial and industrial applications.

Our Massachusetts members, along with every APGA member, are good stewards of the environment, evidenced by the way they maintain and operate their utilities, and they recognize that natural gas provides energy affordably and reliably to Massachusetts' residents and all Americans, in addition to proven environmental benefits. Natural gas has been the main contributor to the decline in carbon emissions in Massachusetts and our country as a whole, and the existing pipeline infrastructure should continue to play an integral role in reducing greenhouse gas (GHG) emissions.[1]

APGA is especially concerned with the proposed CHS in its current form. It posits a plan that aims for the complete elimination of natural gas. APGA supports responsible climate conscious policies; however, importantly, removing the option of natural gas for heating homes puts an unfair economic burden on Massachusetts residents and utility providers. It also could have limited, if any, emissions reductions especially considering the high efficiency of the direct use of natural gas technologies. Instead of phasing out natural gas, the state of Massachusetts should consider a revised approach to clean energy goals that maintains the utilization of natural gas, while also integrating renewable natural gas (RNG) and hydrogen, a strategy that enables Massachusetts to meet its climate targets while ensuring Massachusetts residents and businesses retain access to affordable and reliable energy. In addition, this path forward continues to utilize the investments the state has made in its existing pipeline infrastructure and competent utility workforce.

The following elaborates on why natural gas and the infrastructure APGA members operate should be a part of Massachusetts's clean energy future. APGA hopes the DEP will take them into consideration as it develops a CHS.

**1. Community-Owned Gas Utilities Ensure Energy Resiliency**

[1] United States Environmental Protection Agency, "Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2019," https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks.

Energy supplied by public gas utilities, like those in Massachusetts, play a critical role in ensuring energy resiliency in the communities they serve. A report by the Natural Gas Council reveals:

> "The operational characteristics of the natural gas transportation network, in combination with the physical properties of natural gas, effectively minimize the likelihood and severity of service disruptions. In the rare event of a disruption, impacts are typically localized and brief. History demonstrates that disruption of firm pipeline transportation and/or storage services resulting from severe weather events are extremely rare."[2]

Also, GTI Energy found:

> "Natural gas service disruptions are rare. On average, only 1 in 800 natural gas customers experience an unplanned outage in any given year. In comparison, electric system customers experience an average of one unplanned outage per year per customer."[3]

Reliable natural gas is needed for Massachusetts households and businesses, and natural gas has and should continue to fill this need.

As well, natural gas back-up generators provide numerous families and essential services with a dependable source of power when electricity is unavailable. While a natural gas generator is already cleaner than one powered by diesel, innovation is being explored to lower emissions even further. One such example is a micro-CHP system, which is typically used in homes or smaller commercial applications, and generates electricity by converting natural gas to power with minimal emissions while also capturing what would be waste thermal energy and instead utilizing it to heat the building.

A trustworthy and diverse energy supply is critical to both national and domestic security, and we urge the state to be mindful to protect Massachusetts's energy resiliency through the continued utilization of natural gas and the pipeline infrastructure.

2. **Community-Owned Gas Utilities Deliver Affordability**

Natural gas is a key component in maintaining affordability in the communities served by public gas systems, such as those in Massachusetts. Currently, consumers pay markedly lower prices for the direct use of natural gas for their cooking, home or water heating, and clothes drying needs. The Department of Energy (DOE) published its "2022 Representative Average Unit Costs of Energy," acknowledging electricity is around $42 per million Btu, and natural gas is about $12 per million Btu.[4] A study also shows households with all-electric appliances pay almost $900 a year more than those that have the traditional mix of natural gas and electric homes.[5] In addition to the annual costs, the installation expense of a high efficiency natural gas furnace is

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[2] Natural Gas Council, "Natural Gas: Reliable and Resilient." http://naturalgascouncil.org/wp-content/uploads/2019/04/Natural-Gas-Reliable-and-Resilient.pdf

[3] GTI Energy, "Assessment of Natural Gas and Electric Distribution Service Reliability, https://www.gti.energy/wp-content/uploads/2018/11/Assessment-of-Natural-Gas-Electric-Distribution-Service-Reliability-TopicalReport-Jul2018.pdf.

[4] Department of Energy, "Energy Conservation Program for Consumer Products: Representative Average Unit Costs of Energy," https://www.federalregister.gov/documents/2022/03/07/2022-04765/energy-conservation-program-for-consumer-products-representative-average-unit-costs-of-energy#:~:text=Table%201%E2%80%94Representative%20Average%20Unit%20Costs%20of%20Energy%20for,%20%20%240.00002446%2FBtu.%20%2011%20more%20rows%20.

[5] American Gas Association, Implications of Policy-Driven Residential Electrification, https://www.aga.org/research/reports/implications-of-policy-driven-residential-electrification/

approximately $6,710[6] while the average installation cost of the electric alternative is approximately $20,000[7], with a life expectancy of 21.5 and 15 years respectively. With a shorter heating system life cycle, an electric alternative to natural gas may result in increased out of pocket expenses for property owners.

The affordability of natural gas is a key tool in addressing the social equity concerns posed by household energy burdens. A report by the American Council for an Energy-Efficient Economy (ACEEE) noted:

> "Energy insecurity — the inability to meet basic household energy needs over time — is gaining attention as a major equity issue. Examining energy burden gives an idea of energy affordability and which groups could most benefit from energy justice and energy affordability policies and investments."[8]

ACEEE's report further highlighted that low-income, African American, Hispanic, and Native American households are the demographics most impacted with higher energy cost burdens. These populations often live in Environmental Justice communities and do not own the properties at which they reside. According to the United States Census, in Massachusetts 37.6% of the population live in non-owner-occupied housing units where these tenants are unable to select their energy systems, making energy affordability and rate stability critical. [9]

This is particularly worrisome in Massachusetts communities like Holyoke, Westfield, and Middleborough where a disproportionate share of gas customers are low-income renters, many of which live in Environmental Justice neighborhoods. Although the CHS has proposed a framework to support converting these groups to clean heat, the cost burden of the clean heat will continue on the monthly bill in perpetuity. Therefore, Massachusetts should not ignore natural gas as a key resource in decreasing energy cost burdens, especially for the most vulnerable populations. Ensuring residents have access to the energy needed to heat their homes or water must be a focus of any state policy.

### 3. Community-Owned Gas Utilities Play an Important Role in a Low Carbon Future

Renewable natural gas (RNG) is pipeline-compatible, ultra-clean, and low-carbon. It is derived from the breakdown of organic wastes and can be processed to be used in existing natural gas infrastructure interchangeably with geologic natural gas in homes and businesses. Hydrogen also has the capability to be blended with natural gas or possibly used exclusively; both pathways have decreased emissions. In the future, blended hydrogen or hydrogen exclusively may be safely utilized in homes, businesses, and commercial applications. By preserving the natural gas infrastructure of today, Massachusetts's public natural gas utilities can be a critical partner in delivering the low carbon fuels of tomorrow, ensuring sustainable energy for many years to come.

* * *

APGA would like to reiterate that the public gas utilities in Massachusetts and all of our members are committed to providing efficient, reliable and affordable energy, while protecting the environment and promoting equity

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[6] Energy Information Administration, "Updated Buildings Sector Appliance and Equipment Costs and Efficiencies," https://www.eia.gov/analysis/studies/buildings/equipcosts/pdf/full.pdf
[7] Massachusetts Clean Energy Center, "MASSCEC PILOT SHOWCASES SUCCESS OF WHOLE HOME HEAT PUMPS," https://www.masscec.com/blog/masscec-pilot-showcases-success-whole-home-heat-pumps
[8] American Council for Energy-Efficient Economy, "How High Are Household Energy Burdens? An Assessment of National and Metropolitan Energy Burdens across the U.S.
[9] United States Census Bureau, "Quick Facts Massachusetts," https://www.census.gov/quickfacts/fact/table/MA/PST045222

with minimal disruption to consumer choice. As the state pursues finalization of a CHS, APGA requests consideration of the unique operating circumstances of Massachusetts's public gas utilities and encourages the continued utilization of their valuable infrastructure and experienced workforce in achieving the state's clean energy goals.

If you would like to discuss further, please do not hesitate to contact me.

Respectfully submitted,

Stuart Saulters
Vice President of Government Relations
American Public Gas Association

ASSOCIATED INDUSTRIES OF MASSACHUSETTS

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December 21, 2023

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

**RE: Clean Heat Standard Draft Program Framework**

Commissioner Heiple,

The Associated Industries of Massachusetts (AIM), founded in 1915, is the state's largest business association. We serve the needs of more than 3,400 businesses across 150 different industries, representing more than 650,000 Massachusetts employees.

Every day we work to help businesses unlock their full potential. We fiercely advocate for positive public policy change that creates economic opportunity and ensures our business community is in a position to grow and thrive in the Commonwealth.

It is in that context that AIM would like to thank you for the opportunity to provide comments on the Draft Clean Heat Standard (CHS) Framework document, and for the time and effort that the Department of Environmental Protection (DEP) has committed to this initiative. The CHS has the potential to become a critical tool in the Commonwealth's decarbonization efforts, underscoring the importance of ensuring that the framework that will inform the regulatory program itself has been carefully considered and analyzed by affected stakeholders. As such, we respectfully ask the DEP to extend the deadline for the comment period by an additional sixty days, from the current December 21, 2023 deadline to February 21, 2024.

This additional time will allow stakeholders to thoroughly review the effects that a CHS, designed within the guideposts of the current framework, will have on the costs of residential housing projects, energy markets and the costs of our transmission infrastructure, as well as research and development of alternative fuels. We appreciate this Administration's commitment to solving the Commonwealth's housing crisis and recognize that the energy transition poses significant challenges to the housing sector. The Commonwealth already has some of the highest housing costs in the nation, and our older housing stock is extremely difficult to decarbonize. Efforts to build new homes are not keeping up with the demand and are slowed by the difficulty that project owners experience in connecting their properties to the electricity grid, and by a growing number of new building code requirements. The constraints on housing, in turn, make it difficult for the Commonwealth to stay competitive in attracting the talent pool that our businesses need to thrive and support a strong local economy. A CHS is sure to have far reaching effects on our residential housing market, making it critical that the design of the CHS framework and regulations supports both heating decarbonization and affordable home building that does not burden potential homeowners with extremely high costs.

Likewise, the CHS may have a significant effect on the costs for all the necessary upgrades to our transmission infrastructure. ISO New England conducted a "2050 Transmission Study," which estimates that our peak electricity load in 2050 will be about 57 gigawatts (GW). Serving this peak load, the study states, will cost between $23-$26 billion. The study also offers that by building some flexibility into the system and allowing just 20% of heating to come from stored fuels on the coldest days of the year could bring the peak load down to 51GW, reducing the associated costs of serving such a load to between $16-$17 billion. As such, we ask the DEP to remain open to various technologies, such as stored or alternative fuels, and their ability to help reduce emissions in different use cases. This will allow the CHS to balance both our decarbonization goals with cost containment and the need to ensure that our energy transition is affordable, equitable, and allows Massachusetts businesses and the residents that live and work here to continue to thrive.

On behalf of our members, thank you again for taking the time to consider AIM's comments, and for your sincere efforts to help the Commonwealth reach its climate goals. We look forward to working with you on the development of a CHS, and to being a partner in an energy transition that is successful, affordable, and equitable.

If you have any questions or would like to speak further, please do not hesitate to reach out to me at either 617-262-1180 or sswanson@aimnet.org.

Sincerely,

Stephanie L. Swanson
*Executive Vice President of Government Affairs, AIM*

## Parnay, Angela L (DEP)

**From:** Carla Belkin <carlakr@icloud.com>
**Sent:** Saturday, December 16, 2023 3:01 PM
**To:** Strategies, Climate (DEP)
**Subject:** The proposed “CleanStandard”



On discovering the ill conceived proposal to insist that business comply with your plan to replace current heating systems with heat pumps, I suggest you do some investigation into the actual mechanics of what you propose. Having lived in Chicago, with a heat pump, I could never get warm. There was never sufficient heat to make a home in that northern climate comfortable, summer or winter. Our electric bill was enormous. Our grid is already strained to its limits. Where are these units you are putting forth, made? In China? Just like the windmills and solar panels that ultimately will break and need repair or disposal which only hurt the environment.
In my memory, we were always waiting for unavailable parts for our heat pump. Who do you expect will ultimately pay for this? ANSWER: The consumer.

I thought that this was America. A place where the individual had a say on the direction of plans that would affect our lives. This requires it be put to a vote. Not only do you not have an affirmative vote on my part but I will encourage as many people as possible to make them aware of how inappropriate your plan and the imposition upon our lives it will ultimately have.

If the politicians who support you and display favor that blows in your direction, will soon find themselves looking for another job as well.

Carla Belkin
Chatham, MA

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**Massachusetts Department of Environmental Protection**
**MA Clean Heat Standard │ Stakeholder Input**

This comment is intended to address topic #3 of the stakeholder input on credit generation. This comment will specifically focus on the use of direct biogenic content measurements following ASTM D6866 Method B in order to demonstrate emissions reductions under the program.

Included here you will find:



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## About Beta Analytic

Beta Analytic was among the originators of the ASTM D6866 biobased / biogenic testing standard using carbon-14 to distinguish renewable carbon sources from petroleum sources in solids, liquids, and gasses. Renewable testing started in 2003 at the request of United States Department of Agriculture (USDA) representatives who were interested in Beta's Carbon-14 capabilities for their USDA BioPreferred® Program (www.biopreferred.gov). Carbon-14 third party testing is now standardized in a wide range of international standards including ASTM D6866, CEN 16137, EN 16640, ISO 16620, ISO 19984, BS EN ISO 21644:2021, ISO 13833 and EN 16785. Beta Analytic continues involvement in ASTM D6866 revisions with the current president, Ron Hatfield, serving as technical advisor and committee member to both the ASTM D20.96 and USDA BioPreferred Programs.

Carbon-14 standardized testing is also incorporated in a variety of regulatory programs including the California AB32 program, US EPA GHG Protocol, US EPA Renewable Fuels Standard, Canada's Clean Fuels Regulation, United Nations Carbon Development Mechanism, Western Climate Initiative, Climate

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Registry's Greenhouse Gas Reporting Protocol, the EU Renewable Energy Directive and EU Emissions Trading Scheme.

**Recommendations for the MA Clean Heat Standard**

The purpose of this comment is to recommend the use of direct biogenic content measurements following ASTM D6866 Method B as a critical tool for validating credit generation under the proposed Clean Heat Standard. This section will explain why direct biogenic content measurements should be required for any biofuels seeking to generate credits for emissions reductions under the program.

**What is Biogenic Content?**

Biogenic content is the biomass based portion of feedstocks, fuels and emissions. Recently biogenic content has been at the center of the conversation around decarbonizing fuels used in transportation and industrial facilities. With the rapid growth of government programs designed to decarbonize these sectors in recent years, biogenic content testing has played an important role in monitoring and verifying the renewable content of fuels receiving incentives.

MassDEP should add direct testing requirements to the Clean Heat Standard because it is the most effective way to guarantee that emissions reductions achieved from the use of biofuels under the program are quantified properly. Including these requirements would be consistent with the goals established throughout section 3 on credit generation.

Since under the program as proposed, "Eligible waste-based liquid biofuels would be credited based on the assumed avoidance of all emissions from combustion of an equivalent quantity of heating oil. Other liquid biofuels eligible for the federal Renewable Fuel Standard would receive half credit through 2030 only," direct testing requirements would serve as the most practical way of implementing the program. Beta would recommend replacing the word "assumed," with "demonstrated," and crediting based on directly quantified avoidance of emissions achieved by using waste-based biofuels rather than heating oil.

Requiring direct testing following ASTM D6866 Method B to demonstrate emissions reductions for biofuels produced from municipal solid waste (MSW) would be in line with leading renewable fuel regulations around the world including the EPA Renewable Fuel Standard (RFS),[1] California's Low Carbon Fuel Standard (LCFS),[2] Oregon's Clean Fuel Standard (CFS),[3] Canada's Clean Fuel Regulations (CFR)[4] and the EU Renewable Energy Directive (RED),[5] among others. The program should also follow the RFS

[1] 2010. "40 CFR Part 80 Subpart M– Renewable Fuel Standard." *National Archives Code of Federal Regulations*
[2] 2020. "Reporting Co-Processing and Renewable Gasoline Emissions Under MRR." *California Air Resources Board*
[3] 2016. "40 CFR Part 98 Subpart C– General Stationary Fuel Combustion Sources."
[4] 2022. "Quantification Method for Co-Processing in Refineries." *Government of Canada*
[5] 2018. "Directive 2018/2001 of the European Parliament and the Council." *Official Journal of the European Union*

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requirements of direct testing for co-processed fuels and fuels produced from biogas and renewable natural gas (RNG) claiming half credits based on eligibility for the RFS.[6]

Beta further recommends requiring testing for any biofuels claiming emissions reductions under the program because of its superior reliability compared to calculations based methods such as mass balance. Biogenic content measurements are the most direct metric of emissions displaced by using biofuels rather than traditional heating oil.

In particular this rule should be applied to the program's plan that, "For blended fuels delivered by companies with compliance obligations, credits would be assigned to the company delivering the fuel." This would be the most effective way to allow these companies delivering the final fuel to generate credits without providing an incentive for them to overstate their biogenic content in any given batch to receive additional credits. This would be in line with many leading regulations' treatment of blended fuels and fuels for which the final portion of biogenic content is unknown.

One important example to consider in this context is the EU RED's updated co-processing methodology passed in June of 2023.[7] Prior to this update biofuels producers using co-processing could either directly test their biogenic content via C-14 testing or they could submit mass balance calculations. However, this update was issued in response to high volumes of fraudulent ISCC mass balance submissions, which severely dropped the value of European biofuels earlier this year.[8] As a result the update requires producers choosing to use mass balance calculations to verify their calculations with direct testing (Carbon-14) at least quarterly. While this approach is an improvement, exclusively allowing direct testing would be the most effective way of protecting the program from potential fraud.

Beta also recommends that biogenic content be added to the list of criteria to be considered when, "The final regulation would include a requirement to consider expanding eligibility to other fuels in a required 2028 program review." Including this metric for prospective fuels seeking to join the program would provide the most accurate assessment of the decarbonization benefits they could provide.

Adding these requirements would be in line with this section's goal that, "MassDEP would develop and implement verification measures that draw on experience with existing programs such as DOER's Alternative Portfolio Standard (APS) and Mass Save to ensure credit integrity while minimizing the administrative burden of verification." While the APS and Mass Save are yet to implement direct testing, including these requirements would bring the program in line with best practices established by leading renewable fuel programs around the world. This would also in turn set a more stringent precedent for the APS and Mass Save to incorporate moving forward.

[6] 2023. "Final Renewable Fuels Standards for 2023, 2024 and 2025." *Environmental Protection Agency*
[7] 2023. "Renewable energy– method for calculating the share of renewables in the case of co-processing." *European Commission*
[8] 2023. "ISCC Press Release July 27, 2023." *International Sustainability & Carbon Certification*

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**What is Biogenic Testing (Carbon-14)?**

Carbon-14 analysis is a reliable method used to distinguish the percentage of biobased carbon content in a given material. The radioactive isotope carbon-14 is present in all living organisms and recently expired material, whereas any fossil-based material that is more than 50,000 years old does not contain any carbon-14 content. Since Carbon-14 is radioactive, the amount of carbon-14 present in a given sample begins to gradually decay after the death of an organism until there is no carbon-14 left. Therefore, a radiocarbon dating laboratory can use carbon-14 analysis to quantify the carbon-14 content present in a sample, determining whether the sample is biomass-based, fossil fuel-derived, or a combination. This result is measured using an Accelerator Mass Spectrometer (AMS) instrument.

The analysis is based on standards such as ASTM D6866, EN 16640, EN ISO 21644 and ISO 13833. ASTM D6866 is an international standard developed for measuring the biobased carbon content of solid, liquid, and gaseous samples using radiocarbon dating. There are also many specific international standards based on the use of direct Carbon-14 testing, such as EN ISO 21644 which is an international standard for determining the biogenic content of waste-recovered fuels.[9]

Carbon-14 analysis yields a result reported as % biobased carbon content. If the result is 100% biobased carbon, this indicates that the sample tested is completely sourced from biomass material such as plant or animal byproducts. A result of 0% biobased carbon means a sample is only fossil fuel-derived. A sample that is a mix of both biomass sources and fossil fuel sources will yield a result that ranges between 0% and 100% biobased carbon content. Carbon-14 testing has been incorporated into several regulations as the recommended or required method to quantify the biobased content of a given material.

**ASTM D6866 Method B - The Most Reliable Method**

Carbon-14 is a very well-established method which has been in use by many industries (including the fossil fuel industry) and academic researchers for several decades. Carbon-14 measurements done by commercial third party testing is robust, consistent, and with quantifiable accuracy and precision of the carbon-14 amount under **ASTM D6866 Method B**.[10]

Similar programs and standards in the EU have consistently faced challenges implementing Mass Balance and have turned toward direct measurement as a result. The EN 16785 is the only standard that allows a variant of the Mass Balance method of 'carbon counting' under EN 16785-2. The EN 16785-1 requires that the biocarbon fraction be determined by the carbon-14 method. The quintessential risk of allowing the mass balance approach can be seen in the case of fraudulent ISCC mass balance certified biofuels

[9] 2021. "ISO 21644:2021 Solid Recovered Fuels - Methods for the Determination of Biomass Content." *International Organization for Standardization*

[10] 2021. "Standard Test Methods for Determining the Biobased Content of Solid, Liquid, and Gaseous Samples Using Radiocarbon Analysis." *ASTM International (D6866-21).* pp 1-19. doi: 10.1520/D6866-21.

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which plummeted the value of European biofuels in June of 2023.[11] For that reason, when incorporating this EN 16785 method, certification schemes like the "Single European Bio-based Content Certification" **only** allow the use of EN 16785-1 due to its reliability and the value of a third-party certification. http://www.biobasedcontent.eu/en/about-us/

It is very important that testing be required to follow ASTM D6866 Method B in particular. ASTM D6866 Method B uses Accelerated Mass Spectrometry (AMS), while Method C uses Liquid Scintillation Counting (LSC). In Method B, the AMS machine directly measures the $^{14}C$ isotopes. However, in Method C, scintillation molecules indirectly absorb the beta molecules that release with the decay of $^{14}C$ and convert the energy into photons which are measured proportionally to the amount of $^{14}C$ in the sample. Since Method B directly measures the $^{14}C$ isotopes and Method C measures them indirectly, Method B is significantly more precise and should be prioritized in regulations.[12] LSC calculations, like those used in Method C, are commonly used as an internal testing tool when samples are limited and accuracy does not need to be extremely high.

In ASTM D6866 method B, the carbon-14 result is provided as a single numerical result of carbon-14 activity, with graphical representation that is easily understood by regulators, policy makers, corporate officers, and more importantly, the public. The overwhelming advantage of carbon-14 is that it is an independent and standardized laboratory measurement of any carbon containing substance that produces highly accurate and precise values. In that regard, it can stand alone as a quantitative indicator of the presence of renewable vs. petroleum feedstocks. When carbon-14 test results are challenged, samples can be rapidly remeasured to verify the original reported values (unlike mass balance).

Also of significant importance is that carbon-14 measurements are strictly third party generated under ISO/IEC 17025:2017 Testing Accreditation  with no contribution from the submitter, client, or manufacturer.

Most international standards do not cite error limitations, however, the ASTM-D6866 method B standard says that, "Instrumental error can be within 0.1-0.5 % (1 relative standard deviation (RSD), but controlled studies identify an inter-laboratory total uncertainty up to +/- 3 % (absolute). This error is exclusive of indeterminate sources of error in the origin of the biobased content." This has been applied across all industries and establishes a high degree of variability in indeterminate errors likely to exist between different manufacturing processes. This approximation is well understood as are any errors associated with the measurement.

[11] 2023. "ISCC Press Release July 27, 2023." *International Sustainability & Carbon Certification*
[12] 2022. "Testing the methods for determination of radiocarbon content in liquid fuels in the Gliwice Radiocarbon and Mass Spectrometry Laboratory." *Radiocarbon*

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**ISO/IEC 17025:2017 Accredited Laboratory**

To ensure the highest level of quality, laboratories performing ASTM D6866 testing should be ISO/IEC 17025:2017 accredited or higher. This accreditation is unbiased, third party awarded and supervised. It is unique to laboratories that not only have a quality management program conformant to the ISO 9001:2008 standard, but more importantly, have demonstrated to an outside third-party laboratory accreditation body that Beta Analytic has the technical competency necessary to consistently deliver technically valid test results. The ISO 17025 accreditation is specifically for natural level radiocarbon activity measurements including biobased analysis of consumer products and fuels, and for radiocarbon dating.

**Required tracer-free facility for Carbon-14**

For carbon-14 measurement to work, be accurate, and repeatable, the facility needs to be a tracer-free facility, which means artificial/labeled carbon-14 is not and has never been handled in that lab. Facilities that handle artificial carbon-14 use enormous levels relative to natural levels and it becomes ubiquitous in the facility and cross contamination within the facility, equipment and chemistry lines is unavoidable. Results from a facility that handles artificial carbon-14 would show elevated renewable contents (higher pMC, % Biobased / Biogenic values), making those results invalid. Because of this, Federal contracts and agency programs (such as the USDA BioPreferred Program) require that AMS laboratories must be 14C tracer-free facilities in order to be considered for participation in solicitations.

To learn more about the risks associated with testing natural levels Carbon-14 samples in a facility handling artificially enhanced isotopes please see the additional information provided after this comment.

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# Demand a Tracer-Free Laboratory for Radiocarbon Dating

As part of its commitment to provide high-quality results to its clients, ISO/IEC 17025-accredited Beta Analytic does not accept pharmaceutical samples with "tracer Carbon-14" or any other material containing artificial Carbon-14 (14C) to eliminate the risk of cross-contamination. Moreover, the lab does not engage in "satellite dating" – the practice of preparing individual sample graphite in a remote chemistry lab and then subcontracting an AMS facility for the result.

## High Risk of Cross-Contamination

Pharmaceutical companies evaluate drug metabolism by using a radiolabeled version of the drug under investigation. AMS biomedical laboratories use 14C as a tracer because it can easily substitute 12C atoms in the drug molecule, and it is relatively safe to handle. Tracer 14C is a well-known transmittable contaminant to radiocarbon samples, both within the AMS equipment and within the chemistry lab.

Since the artificial 14C used in these studies is phenomenally high (enormous) relative to natural levels, once used in an AMS laboratory it becomes ubiquitous. Cross-contamination within the AMS and the chemistry lines cannot be avoided. Although the levels of contamination are acceptable in a biomedical AMS facility, it is not acceptable in a radiocarbon dating facility.

Biomedical AMS facilities routinely measure tracer-level, labeled (Hot) 14C samples that are hundreds to tens of thousands of times above the natural 14C levels found in archaeological, geological, and hydrological samples. Because the 14C content from the biomedical samples is so high, even sharing personnel will pose a contamination risk; "Persons from hot labs should not enter the natural labs and vice versa" (Zermeño et al. 2004, pg. 294). These two operations should be absolutely separate. Sharing personnel, machines, or chemistry lines run the risk of contaminating natural level 14C archaeological, geological, and hydrological samples.

## Avoid the Risks

Find out from the lab that you are planning to use that they have never in the past and will never in the future:

- accept, handle, graphitize or AMS count samples containing Tracer or Labeled (Hot) 14C.

- share any laboratory space, equipment, or personnel with anyone preparing (pretreating, combusting, acidifying, or graphitizing) samples that contain Tracer or Labeled (Hot) 14C.

- use AMS Counting Systems (including any and all beam-line components) for the measurement of samples that contain Tracer or Labeled (Hot) 14C.

## Tracer-Free Lab Required

Recently, federal contracts are beginning to specify that AMS laboratories must be 14C tracer-free facilities in order to be considered for participation in solicitations.

A solicitation for the National Oceanic and Atmospheric Administration (NOAA) has indicated that "the AMS Facility utilized by the Contractor for the analysis of the micro-samples specified must be a 14C tracer-level-free facility." (Solicitation Number: WE-133F-14-RQ-0827 - Agency: Department of Commerce)

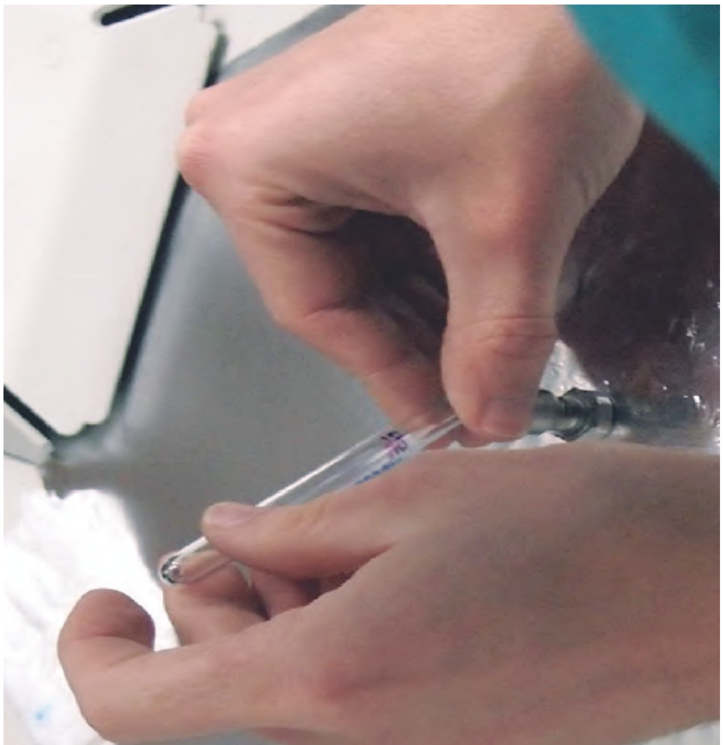
As a natural level radiocarbon laboratory, we highly recommend that researchers require the AMS lab processing their samples to be Tracer-free.

## No Exposure to Artificial Carbon-14

According to ASTM International, the ASTM D6866 standard is applicable to laboratories working without exposure to artificial carbon-14 routinely used in biomedical studies. Artificial carbon-14 can exist within the laboratory at levels 1,000 times or more than 100 % biobased materials and 100,000 times more than 1% biobased materials. Once in the laboratory, artificial 14C can become undetectably ubiquitous on materials and other surfaces but which may randomly contaminate an unknown sample producing inaccurately high biobased results. Despite vigorous attempts to clean up contaminating artificial 14C from a laboratory, isolation has proven to be the only successful method of avoidance. Completely separate chemical laboratories and extreme measures for detection validation are required from laboratories exposed to artificial 14C. Accepted requirements are:

(1) disclosure to clients that the laboratory working with their products and materials also works with artificial 14C
(2) chemical laboratories in separate buildings for the handling of artificial 14C and biobased samples
(3) separate personnel who do not enter the buildings of the other
(4) no sharing of common areas such as lunch rooms and offices
(5) no sharing of supplies or chemicals between the two
(6) quasi-simultaneous quality assurance measurements within the detector validating the absence of contamination within the detector itself.

**ASTM D6866-22** – Standard Test Methods for Determining the Biobased Content of Solid, Liquid, and Gaseous Samples Using Radiocarbon Analysis.



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"… we certainly do not advocate processing both labeled and natural samples in the same chemical laboratory." "The long term consequences are likely to be disastrous."

2. Recovery from tracer contamination in AMS sample preparation. A. J. T. Jull, D. J. Donahue, L. J. Toolin. Radiocarbon, Vol. 32, No.1, 1990, p. 84-85 doi:10.2458/azu_js_rc.32.1253 (Open Access)

"… tracer 14C should not be allowed in a radiocarbon laboratory." "Despite vigorous recent efforts to clean up the room, the "blanks" we measured had 14C contents equivalent to modern or even post -bomb levels."

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"The presence of elevated 14C contamination in a laboratory preparing samples for natural radiocarbon analysis is detrimental to the laboratory workspace as well as the research being conducted."

4. High level 14C contamination and recovery at XI'AN AMS center. Zhou, et. al. Radiocarbon, Vol 54, No. 2, 2012, p. 187-193
doi:10.2458/azu_js_rc.54.16045

"Samples that contain high concentrations of radiocarbon ("hot" samples) are a catastrophe for low background AMS laboratories." "In our case the ion source system was seriously contaminated, as were the preparation lines."

Beta Analytic
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**Parnay, Angela L (DEP)**

**From:** MICHAEL BLAIS <sargent_blais@verizon.net>
**Sent:** Monday, December 11, 2023 5:00 PM
**To:** Strategies, Climate (DEP)
**Subject:** Clean Energy



With the lack of supply in fuel for heat and electricity, you should not be putting undo stress on the market.
If anything, you should allow generators to store natural gas with out tax or penalty for inventory so they can buy their fuel out of season.
Sent from my iPhone

To: Clean Heat Standard Advisors
From: Charlie Cary
Date: 12/20/23

We can't afford to kick the can down the road when it comes to wood residue's inclusion in the Clean Heat Standard! For years the public policy debate has not looked beyond the question of what trees "should" be cut, and acknowledged that millions of tons of wood residue are generated annually in Massachusetts. This wood is chipped for low-cost transport, and is on trucks going somewhere in Massachusetts right now. Most ends up being spread on the ground (Mulch or dumped) or taken to distance inefficient power plants. The creation of biofuels with this resource is years away and involves the inefficient centralization of a decentralized resource. Since the cost of disposing of this wood on the wholesale market is less than the cost to deliver it, wood residue must be considered a waste in our society.

Why isn't wood waste/residue treated like paper, plastics or steel in our waste stream, with focused attention on recycling it? I suggest it is because it is produced by too many sectors of the American economy which are not used to working together. Wood residue is produced by local and state public agencies, non-profit organizations, environmental organizations, utilities, packaging companies and the forest products industry, <u>all of whom would benefit environmentally and financially from higher "wood residue/waste market value.</u> Pulling together these silos of wood residue production into a political force to create positive change has proven to be a challenge (please see my website at www.woodenergyrecyclers.com). Generating heat from wood residue recycles its carbon, keeps dollars in local communities and could be a driver for exemplary forestry and land conservation.

The State's "no emissions" policy is a perfect example of "the desire for perfection is the enemy of the better". Wood heating does have some emissions but its carbon emissions are not from the ground. The carbon in trees has been in our atmosphere and will return to our atmosphere relatively quickly from chipped wood. Rather than allow this carbon to return to the atmosphere without beneficial use, doesn't it make sense to use it to displace carbon from fossil fuel burned in our homes and power plants for heat. The particulate matter emissions from Modern Wood Heating is a fraction of the old wood burning systems which used to filled our valleys with "wood smoke". Despite these emission reductions, public policy toward wood burning has not changed. In addition, it has also been shown that particulate 2.5 from wood burning is less harmful to humans than similar size particulate emissions from burning oil and coal. Given the less harmful emissions from wood, AND the opportunity to displace fossil carbon with carbon from our atmosphere, shouldn't public policy advocate wood heat over electric heat generated from burning coal and oil?

Do Policy Makers really believe we will have "clean" electric generation, or the electric distribution infrastructure, in the foreseeable future given the increased demand created by our electrification energy policies? Wood heat will be needed when we become a winter peaking State to reduce fossil fuel consumption. Utilities will be widening power lines to expand transmission capacity. This action will involve cutting trees.  Tress will also be dying from climate change and hazardous trees will need to be removed at great public and private expense. Please, please think about what is the highest and best use for the resulting wood residue which will not be made into a carbon sequestering product.  We can't afford to wait five years to figure out the highest and best use for ubiquitous wood residue and support its better use today.

Respectfully,
Charlie Cary, Wood Energy Recyclers
www.woodenergyrecyclers.com
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City of Boston Environment

BOSTON PUBLIC HEALTH COMMISSION

January 17, 2024

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

*By Electronic Submission to [climate.strategies@mass.gov](mailto:climate.strategies@mass.gov)*

**Re: Comments on Clean Heat Standard Draft Program Framework**

Dear Commissioner Heiple,

Thank you for the opportunity to provide iterative feedback on the Department of Environmental Protection's (DEP or the Department) development of the Clean Heat Standard (the "CHS"). We appreciate the Department's work on this complex and important program and the development of the framework issued in November 2023 (the "Framework"). Creating a counterpart of the electricity sector's Renewable Portfolio Standard for other forms of fossil fuel heating is an important piece of the "whole of government" response to the climate crisis and its goal of achieving an equitable and affordable transition to a decarbonized future. Reducing greenhouse gas emissions through efforts such as the CHS will contribute to the health of our residents, including by improving indoor and outdoor environmental quality by reducing the amount of combustion byproducts and respiratory irritants that can trigger asthma attacks and other health consequences that are disproportionately experienced in environmental justice communities.

We recognize the balancing act that the Department faces in (i) expeditiously advancing the decarbonization work needed to meet our shared greenhouse gas mitigation targets and (ii) integrating opportunities to advance equity, provide affordable, safe and reliable energy, strengthen the green economy, and help improve public health and resilience. The suggestions in this letter are therefore designed to support the near-term launch of an equitable CHS that can respond to and incorporate new data and strategies over time. In brief:

- We appreciate the Framework's attention to promoting electrification in low-income households and support pairing equitable carveouts with measures, such as bill assistance, to ensure that low-income households fully benefit and are protected from the clean energy transition. The CHS should further utilize credits and Alternative Compliance Payments (ACP) to support equity-related goals, such as delivery of benefits to tenants, particularly low-income tenants in small and medium buildings, and support for small businesses and local workforces. (Section II)

- The CHS should support a cost-effective decarbonization of our energy system that considers both the costs of building out the electric system and maintaining the gas system. A more holistic approach to credit generation will help reduce the overall costs of decarbonizing our energy systems, from lowering individual electricity bills to reducing the costs of maintaining the gas pipeline system. To this end, CHS credit "adders" should be used to incentivize energy efficiency, non-hybrid electrification, roll-back of the gas system, and strategic electrification. (Section III)

- The CHS should not, at least initially, apply to retail sellers of electricity given their existing and ongoing obligations to reduce emissions by increasing their purchase of eligible renewable and clean energy. Increasing electricity costs could inadvertently deter the adoption of electrification. (Section IV)

- We appreciate that the standards for compliance include a separate requirement for electrification and support flexibility for amending the emissions reduction standard to reflect the cleaning of the Commonwealth's electricity supply. (Section V)

- The CHS needs to align with current and evolving state, municipal and utility initiatives, including existing requirements for regulated electric utilities and the Mass Save program. (Section VI)

These issues are discussed in greater detail in the rest of this letter, preceded by additional context on the important public health benefits that a successful CHS can advance.

## I. PUBLIC HEALTH BENEFITS

Reducing combustion heating fuels, such as oil, natural gas, and wood, through efforts such as the CHS will directly contribute to the health and well-being of our residents. Combustion heat sources, even the cleanest burning ones, produce emissions in the form of particulate matter and gases (carbon monoxide, carbon dioxide, nitrogen oxides, and sulfur oxides) which can be respiratory irritants in local indoor and outdoor air. Improving air quality by reducing these irritants means fewer life-threatening asthma attacks for the 30.1% of Boston Public High School students and 13.1% of Boston adults who reported having asthma in a 2021 community health assessment.[1] Data from that same assessment shows that Hispanic/Latinx, Black, and Asian

[1] https://www.boston.gov/sites/default/files/file/2023/05/HOB_Asthma_2023_FINAL_May11.pdf

individuals disproportionately suffer from the disease, making Asthma a health equity issue and efforts to reduce air pollution such as CHS an environmental justice effort.

Further, emissions from combustion fuels directly contribute to greenhouse gases in the atmosphere driving climate change. Climate change is already negatively impacting the health and quality of life of Bostonians. For example, Boston historically experienced an average of 11 days with temperatures above 90 degrees each year between 1971 and 2000; in 2016 there were 22 days over 90 degrees, 2021 saw 24 such days, and experts predict we will experience 55 days per year by 2090. Extended streaks of hot days or single very hot days can be life-threatening events that increase the risks of death from causes such as cardiovascular illness, respiratory illness, heat stroke, and dehydration. Climate change also contributes to changing weather patterns bringing extreme precipitation and storm events that can result in injury or illness during the storm or in its wake due to flooding, downed trees and power lines, mold growth, sewage overflows, and carbon monoxide exposure to name just a few.[2] Combating climate change requires multiple efforts to slow its progress and minimize its impacts. A CHS centered in reducing use of combustion fuels is a critical component of those efforts.

## II. EQUITY

We support the Framework's "equity carve out" to ensure that at least 25% of full electrifications serve low-income customers. This electrification for lower income households should be paired with support for potential pre- and post-electrification barriers, from wire and appliance upgrades to changes in total energy bills. The Framework also presents an opportunity to support participation by tenants, particularly low-income tenants, small businesses and local workforces. These concepts are discussed in greater detail below.

<u>The Electrification Equity Carve Out Should be Retained and Paired with Financial Support for Pre- and Post-Electrification Costs</u>

Measuring equitable distribution of electrification at the individual level, rather than using location in an environmental justice community as a proxy, makes sense at the household level. While eligibility for low-income discount electricity rates is a good preliminary screening tool, we encourage the Department to track the mechanisms used in other programs, such as Mass Save and the Weatherization Assistance Program's distribution of federal funds for weatherization and electrification, and update the CHS as appropriate to make sure we most effectively identify and serve residents most in need of support.

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[2] The Boston Public Health Commission's climate and health website lists even more ways that climate change can affect public health. *See* https://www.boston.gov/government/cabinets/boston-public-health-commission/healthy-homes-and-environment/climate-change-and-public-health.

Because lower-income individuals often face financial barriers to electrification, we encourage the Department to continue to pair electrification measures targeted at low-income communities with financial support for pre- and post-electrification costs, such as knob and tube wire replacement, appliance replacements and potential bill increases. Dedicating a portion of Alternative Compliance Payments to such uses is one approach. As discussed below, we also recommend awarding additional credits for projects that provide more holistic support for electrification work in low-income households.

To the extent that CHS credits are awarded for work at non-residential buildings, equitable distribution should be measured by assessing whether the building is in an environmental justice community, in a densely developed residential neighborhood and/or near populations particularly vulnerable to air pollution, such as schools or retirement communities.

<u>The CHS Program Should Advance Work that Benefits Tenants</u>

Tenants, particularly those in small to medium sized buildings, often have little to no ability to switch their heating choice without permission from and/or participation by their landlords. This population often consists of individuals that are low-income, non-English speakers and/or in environmental justice neighborhoods. In Boston, approximately 65% of our residents are renters and close to two-thirds of those live in buildings with fewer than ten units. This lack of access for tenants could lead to unintended and inequitable negative consequences. As more properties move away from combustion of fossil fuels for heating, the cost of maintaining delivery infrastructure (natural gas lines, delivery of home heating oil, cost of purchasing offsets/credits, etc.) falls on fewer and fewer consumers who will become increasingly unable to pay the growing prices. This has been seen in other communities where a sudden drop in the number of ratepayers for water and sewer has meant that the cost for water had to increase on the remaining ratepayers to upkeep the system which resulted in unpaid bills, shutoffs, and fewer ratepayers to shoulder the increasing costs.[3] One way to mitigate such scenarios is to put in place incentives for landlord participation that are paired with support for lower-income renters to assist in transitioning away from combustion fuels early. This will be most critical in identified environmental justice communities that are already under the burden of other systemic inequities.

We recognize that "solving" the landlord-renter split will not be easy, and it is not a problem unique to CHS. For example, this is an issue of ongoing consideration in the Mass Save Program as well. Creating programs for low-income renters in particular will require balancing

[3] For example, in Baltimore the growing need for emergency and long-term maintenance of the sewer system has fallen to a shrinking customer base, with residents seeing around a 330% increase in the cost of combined sewer and water bills from 2000 to 2015. *See* National Environmental Justice Advisory Council, "EPA's Role in Addressing the Urgent Water Infrastructure Needs of Environmental Justice Communities" (2018), pgs. 62-63.

multiple goals, including increasing access to electrification and avoiding unintended consequences such as higher rents and energy bills.  For example, if heat pumps are installed in buildings that serve tenants, ownership of credits should be allocated among tenants that pay electricity bills to help offset any increased energy costs.

We encourage the Department to explore opportunities for supporting tenants as well as small businesses and local workforces through mechanisms such as CHS credit enhancements and the use of Alternative Compliance Payments.

## III. CREDIT GENERATION

We appreciate the Framework's focus on electrification but a more holistic approach to credit generation will help reduce the overall costs of decarbonizing our energy systems, from lowering individual electricity bills to reducing the costs of maintaining the gas pipeline system.  For example, as described by the Department of Public Utilities:

> [C]onsideration of non-gas pipeline alternatives ("NPAs"), defined broadly to include electrification, thermal networked systems, targeted energy efficiency and demand response, and behavior change and market transformation, is necessary to minimize investments in the gas pipeline system that may be stranded costs in the future as decarbonization measures are implemented.

In particular, we encourage DEP to include CHS credits that incentivize energy efficiency, non-hybrid electrification/roll-back of the gas system, and strategic electrification.[4]  These issues are discussed in more detail below, but two common features to consider are:

- Using a "credit" system similar to that in the SMART program, whereby one credit would be awarded for an electrification project with an adder, or detractor, for additional features, such as associated electrification; and

- Using data collected through the Mass Save program, *e.g.,* emission reductions associated with various forms of weatherization, to inform the value of CHS credits and ongoing emission reductions from various actions.

[4] The Framework's current approach to renewable natural gas (RNG) and hydrogen aligns with the Department of Public Utilities' finding that "more studies are required …to support the claim that RNG is a zero-emissions fuel" and that any costs associated with the use of RNG must be borne by the specific customers that will take the RNG supply rather than by all customers in the rate base. DPU 20-80-B Order (2023), pg. 68.  We support the Framework's proposal to consider the lifecycle analysis of greenhouse gas emissions as well local air pollution impacts from the production or combustion of any alternative fuels considered for CHS credits in the future.

Enhancing the value of credits for specific work can also support initiatives such as participation by tenants by giving regulated entities a "bonus" for delivering full electrification to eligible tenants and/or apartments.

<u>CHS Credits Should be Awarded for Energy Efficiency Work</u>

Boston believes that the best approach for achieving net-zero carbon emissions by 2050 is to eliminate fossil fuel use to the greatest degree possible. As such, we support the Framework's focus on electrification but urge DEP to utilize credits to advance energy efficiency as well.

Energy efficiency is an important building block for both reducing the amount of electricity we will need going forward and improving the performance and cost effectiveness of electrified homes.[5] As forecasted in the electric sector modernization plans recently submitted to the Grid Modernization Advisory Council (GMAC), there will be a significant growth in net electric demand, particularly in the Boston metro area, to meet our climate policy goals. We should continue to pursue all reasonable and viable opportunities to reduce this demand and the amount of new infrastructure that will be required to meet it.

The following are suggestions for integrating energy efficiency into the CHS credit generation system:

- Only award electrification credits to buildings that have received weatherization/energy efficiency work. This has the co-benefit of improving comfort and reducing energy bills for households, which is particularly important for low-income households with high energy burdens.[6] (This would mirror the approach in Mass Save, which requires homeowners to sufficiently weatherize their homes in order to qualify for the highest tier of heat pump rebates.)

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[5] *See e.g.,* Massachusetts Clean Energy and Climate Plan for 2050 (2022), pg. 57 ("[T]he CHS will be used to reduce GHG emissions from building heat, with a focus on encouraging electrification and energy efficiency"); The Cadmus Group, et al., "Building Sector Report: A Technical Report of the Massachusetts Decarbonization Roadmap Study" (2020), pg. 11 (finding that electricity demand would increase 18% if a limited level of energy efficiency were implemented in the *Limited Efficiency* pathway versus a high level of energy efficiency in the *All Options* pathway.); DPU 20-80-B Order (2023), pg. 120 ("The Department also previously directed the LDCs to weatherize prior to or as part of an electrification project to ensure that overall energy consumption will decrease, while minimizing ratepayer bill impacts, particularly for LMI customers.")

[6] Cohn, C., and N.W. Esram, "Building Electrification: Programs and Best Practices," (2022) pg. V. (finding that pairing efficiency upgrades with electrification reduces thermal loads and upfront costs while improving comfort and lowering peak electric demand).

- ○ Award 1 CHS credit for buildings that have already received the requisite efficiency work, through private investment or a program such as Mass Save.

- ○ Award an "enhanced" credit, *e.g.,* 1.X CHS credits, for buildings that have not yet received adequate efficiency upgrades. This would reflect the added cost of combining electrification with weatherization/efficiency work.

- Assign credits to energy efficiency/weatherization work separate from electrification. This credit would not be available to individuals that receive benefits for efficiency work through the Mass Save program but could help fill the service gap that exists due to constraints in the Mass Save budget and covered territory. Efficiency credits could be awarded at a percentage of a full electrification credit, *e,g,* 0.X credits.

<u>The CHS Program Should Incentivize Prioritization of Full Electrification/Non-Hybrid Projects that Reduce Ongoing Use and Maintenance of the Gas System</u>

A more nuanced accounting for credits could also support full electrification that is paired with disconnections from the gas system or even removal/roll back of gas infrastructure. As the DPU recently observed, it "is not persuaded that pursuit of a broad hybrid heating strategy that would necessitate maintenance of the natural gas system to support backup heating systems is a viable path forward."[7]

Hybrid systems that require customers to maintain both a natural gas and electrical interconnection will result in increased costs to customers, both for the connections and to maintain two sets of equipment. Retaining the existing natural gas system will also require significant expenditures to maintain the integrity of the pipes and related infrastructure. As the Commission on Clean Heat noted, "to resource the transition appropriately, efficiently, and equitably, it will be critical to [...] avoid future investments in and strategically retire gas infrastructure to reduce total costs."[8]

Moreover, reducing reliance on fossil fuels for indoor use of gas appliances as well as heat will improve indoor and outdoor environmental quality by reducing the amount of combustion byproducts, such as particulate matter, which are respiratory irritants that can trigger asthma

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[7] DPU 20-80-B Order (2023), pg. 55

[8] Massachusetts Commission on Clean Heat Final Report (2022), pg. V; *see also* DPU 20-80-B Order (2023), pg. 117 ("The Department shares the concerns expressed by numerous commenters, however, that a customer's retention of a gas furnace or boiler to service exclusively as a cold-climate backup may not be necessary.")

attacks.[9] Asthma is a life-threatening chronic illness that affects a third of Boston public high school students and 13% of adults in the city (as compared to 11.7% of adults in Massachusetts and 9.8% nationwide).

Focusing credits on projects that help transition our energy system away from gas will align with the Commonwealth's broader goals and serve the interests of our residents. The following are suggestions for utilizing CHS credits to better incentivize full electrification that can support roll backs of the gas system.

- Define full electrification to include replacement of gas appliances, *e.g.,* stoves and water heaters, so that there is no remaining use of gas other than as a backup supply. This would align with the Clean Energy and Climate Plan for 2025 and 2030, which discusses residential heating as including emissions from all on-site combustion of fuels for water heating, cooking, and other needs.[10]

    - Projects that electrify only heating systems should receive a reduced credit, *e.g.,* 0.9 CHS credits, versus projects that electrify all gas systems in a building.

    - Given the additional cost barriers that may be associated with electrifying appliances, a credit "adder" should be available for projects where the regulated entity pays for required electrification upgrades and/or new appliances in low and medium income households.

- Award an "enhanced" credit for buildings that electrify <u>and</u> disconnect from gas, *e.g.,* 1.X CHS credits. Disconnecting could be measured by the removal of gas appliances, such as furnaces, or the capping of gas pipelines.

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[9] *See e.g.,* Eric D. Lebel, Colin J. Finnegan, Zutao Ouyang, and Robert B. Jackson, Methane and NOx Emissions from Natural Gas Stoves, Cooktops, and Ovens in Residential Homes, Environmental Science & Technology (2022), 56 (4), 2529-2539 (estimating that natural gas stoves emit 0.8-1.3% of the gas they use as unburned methane); and Brady Seals and Andee Krasner, Health Effects from Gas Stove Pollution, Rocky Mountain Institute, Physicians for Social Responsibility, Mothers Out Front, and Sierra Club, (2020) (comparing indoor NO2 emissions to outdoor standards from the Environmental Protection Agency, Canada and California and to indoor standards from Canada and the World Health Institute). *See also*; Gruenwald, T., Seals, B.A., Knibbs, L.D., Hosgood, H.D., III Population Attributable Fraction of Gas Stoves and Childhood Asthma in the United States., Int. J. Environ. Res. Public Health (2023), 20, 75 ("Indoor gas stove use for cooking is associated with an increased risk of current asthma among children and is prevalent in 35% of households in the United States.")

[10] Massachusetts Clean Energy and Climate Plan for 2025 and 2030 (2022), pg .21

The CHS Program Should Encourage Strategic Electrification

The generation of CHS credits can also support the advancement of strategic electrification. Strategic electrification can be defined in many ways, but the core objective is to replace direct fossil fuel use with electricity in ways that reduce overall emissions and maximize cost-effectiveness and the delivery of co-benefits. For example, as described in the electric sector modernization plans submitted to the GMAC, "the pace and prioritization of specific electricity network investments should be based in part on identified opportunities to avoid gas system investments where accelerated comprehensive electrification can avoid gas network reinforcements or allow for targeted decommissioning of gas assets."[11] What should be incentivized as strategic electrification may evolve over time, but in the near-term we recommend using CHS credits to support:

- Community battery systems that can reduce peak demand and provide resilience to neighborhoods with high electric loads;

- Collective costs of networked geothermal systems or microgrids that can bring clean electricity to multiple properties;

- Targeted electrification projects prioritized by DPU, regulated utilities and/or municipalities; and

- Electrification costs that fall between the standard budgets of residents and what is covered by utilities, such as new transformers needed to support electrification of low-income, multi-family buildings. Such credits could be targeted to investments that support multiple end-users.

These types of efforts, which can support residents at the neighborhood rather than individual level, can be supported through the award of credits and through funding from Alternative Compliance Payments.

## IV. REGULATED ENTITIES

The CHS is an important tool to make sure that combustible heat source suppliers contribute to the reduction of greenhouse gasses. A counterpart to the electric sector's Renewable Energy Portfolio and Clean Energy Standard has been a missing piece of the puzzle and we appreciate

[11] Eversource Electric Modernization Plan (Sept 2023), pg. 525 and National Grid Future Grid Plan (Sept 2023), pg. 383; *See also* DPU 20-80-B Order (2023), pg. 70 ("As the Commonwealth strives to achieve its 2050 climate targets, we envision that the long-term use of the natural gas distribution system generally will be limited to strategic circumstances where electrification is not feasible for all natural gas appliances.")

the Department's work on this complicated issue. The CHS should not, at least initially, apply to retail sellers of electricity given their existing and ongoing obligations to reduce emissions by increasing their purchase of eligible renewable and clean energy. This approach has been, and continues to be, contemplated by many entities envisioning a clean heat standard. For example, the Commission on Clean Heat encouraged the Department to evaluate (i) the cost impacts on electric consumers of including electric utilities as obligated parties at the outset and (ii) the option of inclusion in later years to meet the CHS' objectives with the declining consumption of fossil fuels.[12]

Electric customers already pay for the greening of the electricity supply and the infrastructure needed to meet increased electric demand, whereas fossil fuel prices "have relatively few policy-driven charges included in them."[13] The extensive adoption of heat pumps should not be de-incentivized by unnecessarily increasing the cost of electricity; doing so would be counter to the goals of the CHS.

Considering potential future inclusion of electric retail sellers as obligated entities during the Department's planned periodic program reviews will allow the CHS to respond to evolving data and considerations at both the Legislative and Executive branches on how to balance the transition from gas and other fossil fuels to electricity. For example, the cost of gas companies meeting CHS obligations may be offset by reducing costs incurred from developing new and/or maintaining existing infrastructure and there may be new mechanisms in the future for sharing costs between at least large gas and electricity providers.

## V. STANDARDS

We support the inclusion of an electrification standard separate from an emission reduction standard. This dual approach recognizes that the "Commonwealth's dominant building decarbonization strategy is electrification"[14] and that current programs that advance electrification, such as Mass Save, cannot alone support the scale and pace of building electrifications needed to meet our emission reduction targets. However, as discussed further in

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[12] Massachusetts Commission on Clean Heat Final Report (2022), pg. 45. *See also*, proposed bill H.3694, An Act Relative to the Clean Heat Standard (proposing to not include electricity suppliers as obligated parties.)

[13] Memorandum from Sustainable Energy Advantage and Synapse Energy Economics to DEP, "Options for Role of Electric Distribution Companies (EDCs), Obligated Fuels, and Obligated Entities" (2023), pg. 10 (suggesting that "it may be more appropriate to apply the CHS obligation to fossil fuel sales.")

[14] Massachusetts Clean Energy and Climate Plan for 2025 and 2030 (2022), pg. 27; *see also* DPU 20-80-B Order (2023), pg. 1 ("[T]he Department finds that to achieve the Commonwealth's climate targets, there must be a significant increase in the use of electrified and decarbonized heating technologies.")

the section on Credit Generation, we encourage further consideration of what is credited as "full electrification."

We understand the planning value of projecting the annual standards into the future, but would appreciate clarification of whether the increasing emission reduction targets take into account the projected cleaning of the electricity supply in Massachusetts. As we add more non-emitting sources to the grid, such as large hydropower and offshore wind, the scope of emissions from electricity use will shrink. If not already incorporated, we encourage DEP to clarify in the final CHS that the emission reduction standard may be adjusted in periodic program reviews to reflect the grid's emissions profile. (The emissions standard may also need to be revisited if, as we suggest, retail electricity sellers are not included as obligated entities.)

## VI. COORDINATION WITH OTHER PROGRAMS

The CHS will operate in conjunction with existing and evolving laws and initiatives aimed at supporting the expansion of clean energy. As such, the CHS is one puzzle piece in reaching the Commonwealth's climate goals, and the puzzle can not be correctly built without seeing how each part fits together to achieve our shared goals. For example, as discussed above, many retail sellers of electricity are already subject to requirements to reduce emissions from their energy supply.

As the Framework notes, it is important to minimize double-counting between CHS credits and Mass Save investments. However, two changes could better support coordination.

1. There is still a need and space for the CHS to support energy efficiency work. Thus, as discussed above, CHS credits should be awarded to energy efficiency work that is not fully funded by Mass Save. CHS credits should be allocated to the portion of energy efficiency work not otherwise funded by Mass Save.

2. The Framework's proposal to allow regulated entities to receive credit for electrification projects completed under Mass Save should be removed in order to avoid (i) double counting and (ii) creating a competitive disadvantage for municipal aggregation programs and smaller energy providers that do not participate in Mass Save.

   At a minimum, revisions should be made to protect municipal aggregation programs if retail sellers of electricity are regulated entities under the CHS. It is unclear whether the allocation of electrification credits funded by Mass Save would include competitive suppliers. If it would not, the Framework would disadvantage municipal aggregation programs that often procure cleaner electricity than required by state law. If competitive suppliers that sell electricity to participants in municipal aggregation programs are required to buy credits under the CHS they will do so completely at the expense of their customers, many of whom also pay into the Mass Save fund. If a regulated electric utility can use Mass Save funds to comply with the CHS requirement, it will have a smaller cost impact on customers. Thus, municipal aggregation prices may increase at a higher rate than basic service, thereby harming an important tool in providing affordable energy and meeting the Commonwealth's climate goals. This harm would be avoided by not applying the CHS to retail sellers of electricity or, in the alternative, (i) clarifying that competitive suppliers selling in municipal aggregation programs will receive a share of Mass Save electrifications credits or (ii) exempting retail sales to customers in municipal aggregation programs.

At a more holistic level, the Department should engage with other agencies, the Legislature and municipalities to identify and implement changes that are needed to advance the goal of replacing fossil heating fuels with clean heat. For example, the efficacy and cost effectiveness of the CHS could be increased by updating the "mandate to serve" provision in G.L. ch. 164, § 92 and investigating cost share approaches that would support maintenance of the gas system as its rate base shrinks due to increased electrification.[15]

* * *

Thank you for your continued work on this complex program and consideration of these comments. To recep, we encourage a continued and expanded focus on equitably distributing the installation of heat pumps and resulting public health benefits in a way that protects low-income households from any cost increases associated with the clean energy transition. The Framework's proposed use of CHS credits should be expanded to incentivize delivery of benefits to tenants and small businesses and projects that promote energy efficiency, non-hybrid electrification, roll-back of the gas system, and strategic electrification. And for at least the early years of the CHS program, the requirements should not apply to retail sellers of electricity as these entities are already required to "green" their supply through other programs.

We look forward to future opportunities to engage in the development of the CHS. Please direct any questions to Aladdine Joroff, Director of Climate Policy (aladdine.joroff@boston.gov).

Sincerely,

Chief Mariama White-Hammond
Environment, Energy and Open Space

Bisola Ojikutu, MD, MPH, FIDSA
Commissioner of Public Health, City of Boston
Executive Director, Boston Public Health Commission

[15] As discussed in the electric sector modernization plans and elsewhere, the shifting of heat systems and customers from gas to electric will require significant coordination between utilities and other energy providers, with oversight from the state.

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December 18th, 2023

Commissioner Bonnie Heiple
100 Cambridge Street, Suite 900
Boston, MA 02114

**RE: Clean Heat Standard and Recognizing All GREET Model GHG Reductions**

Dear Commissioner Heiple,

We greatly appreciate the Department's efforts to decarbonize Massachusetts's energy supply via the development of a Clean Heat Standard. This policy gradually transitions the heating energy sector from fossil to renewable fuels. Clean Energy's primary business is the provision of low to negative carbon biofuels for the transportation sector but is very concerned with protecting the principle of fuel neutrality based on carbon reductions for all energy related policies.

As has been mentioned by other commentors, the Argonne GREET model is the gold standard for determining carbon emission reductions. The current Clean Heat Standard draft framework undermines both the aim of the policy and prevailing science by specifically excluding carbon negative energy sources such as Renewable Natural Gas (RNG) which are derived largely from agricultural waste and landfills.

Under California's Low Carbon Fuel Standard, which utilizes the GREET model, RNG has achieved net negative carbon ratings of -500 $CO_2$/MJ. Excluding this valuable energy source from the Clean Heat Standard will not only make compliance more costly but also deprive Massachusetts's agricultural sector of a financial incentive to capture harmful methane emissions.

We respectively request that the Clean Heat Standard provide full credit for all emission reductions recognized by the Argonne GREET model which includes RNG.

Sincerely,

Brett Barry
Policy Director – Eastern U.S.
Clean Energy

December 21, 2023

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

**Feedback on Draft Clean Heat Standard Framework**

Dear Commissioner Heiple,

The Coalition for Renewable Natural Gas (RNG Coalition) offers the following feedback regarding the Draft Clean Heat Standard (CHS)[1] recently published by the Massachusetts Department of Environmental Protection (DEP). Our organization previously submitted extensive comments on this subject which outlined the role of renewable gas based on examples from leading climate jurisdictions; provided an overview the long-standing, science-based conclusions regarding the impact of biogas and renewable natural gas (RNG); and summarized what we believe to be a well-rounded strategy for renewable gas technologies based on these conclusions.

DEP's exclusion of renewable gas—especially RNG—from crediting under the draft framework was surprising to our industry, especially given the inclusion of other bioenergy technologies which are slated to play a complimentary role alongside building electrification. With this in mind, we urge DEP to recognize the clear benefits and established strategies for renewable gases—with specific attention to RNG—and **include these technologies as eligible in the forthcoming CHS.**

*Summarizing the GHG Benefits and Role of Renewable Gas*

Renewable gases (in this case, RNG and renewable hydrogen) can serve as a climate change mitigation tool across multiple sectors of the economy. Including these resources in the final CHS regulation will increase clean fuel supply; the capture and utilization of methane emissions from organic waste streams; and circularity in Massachusetts' economy through recycling, the creation of bioproducts, and carbon sequestration. Compound benefits result from (1) the displacement of anthropogenic carbon dioxide ($CO_2$) emissions from the combustion of fossil fuels, (2) the critical near-term greenhouse gas (GHG) benefit of increased methane capture and destruction, and (3) air and water quality improvements that result from better management of organic waste. There is significant data which supports these conclusions, including for carbon accounting and GHG impact, which we expanded upon in our previous comments.

[1] https://www.mass.gov/info-details/massachusetts-clean-heat-standard#contact

Indeed, Massachusetts policymakers must continue to explore how to address waste produced by the Commonwealth's citizens, in line with its organic waste goals.[2] Recycling waste into circular fuel and platform molecules via anaerobic digestion is expected to continue to be a primary strategy for doing so. Massachusetts currently exports a significant amount of its waste[3]—along with the associated emissions and air and water quality impacts. The creation of renewable gas via anerobic digestion as an organic waste management strategy is widely substantiated by organizations ranging from the Biden Administration's recent draft food waste recycling and methane reduction plan[4] to Denmark's successful organic waste[5] and renewable gas[6] strategies. Excluding renewable gases from the CHS program removes an incentive which would help to accomplish these goals.

The near-term introduction of these resources within the existing gas system—driven by the demand to decarbonize applications which currently utilize fossil-derived natural gas, including in the building sector—will establish necessary infrastructure (e.g., RNG upgrading equipment and pipeline interconnections) for decarbonizing hard-to-abate sectors[7] in a world where many end-uses are electrified. Introducing supply-side renewable gaseous resources does not result in expanded demand-side gas infrastructure (e.g., new gas connections). Our previous comments provided an extensive overview of gas sector decarbonization strategies from leading climate jurisdictions which substantiate this method of using renewable gas.

Perhaps the best example of a similar policy which explicitly connects gas sector and waste decarbonization goals can be found in California's Renewable Gas Standard. In 2022 the California Public Utilities Commission (CPUC) adopted its Renewable Gas Standard (RGS) by a unanimous vote, setting mandatory RNG procurement targets for the state's gas utilities according to the following schedule:

- A short-term target of 17.6 BCF/year by 2025, sourced primarily from anaerobic digesters which utilize organic waste diverted from landfills.
- A mid-term target of 72.8 BCF/year by 2030 and beyond—equal to approximately 12.2 percent of total annual statewide gas IOU core customer consumption in 2020.

The program is designed to prioritize resources which provide additional environmental benefit by reducing methane from landfills through pairing with RNG sources that support organic waste diversion; the use of carbon capture and sequestration to achieve carbon-negative

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[2] https://www.mass.gov/guides/commercial-food-material-disposal-ban

[3] https://www.mass.gov/doc/2021-solid-waste-data-update/download#:~:text=Massachusetts%20collectively%20exported%202%2C920%2C000%20tons,percent%2C%20from%202020%20to%202021.

[4] https://www.epa.gov/newsreleases/biden-harris-administration-releases-draft-national-strategy-reduce-food-loss-and

[5] For example, Denmark has achieved a stable 5-6% landfill rate: https://dakofa.com/element/landfilling-in-denmark/

[6] https://ens.dk/sites/ens.dk/files/Naturgas/groen_gasstrategi_en.pdf

[7] For example, but not limited to high-heat industrial processes, customers with high reliability needs, heavy-transportation fuels, and electricity generation.

emissions; reducing forest fire risk through wood waste management; reducing transportation sector criteria pollutants; and creating a circular economy. Importantly, the CPUC is currently working to expand this program to hard-to-decarbonize sectors. The current program design incents RNG in residential and commercial sectors, despite the long-term goal of electrifying large portions of those sectors, and considering the fuel's long-term use in other parts of the economy.

With this in mind, we are surprised and concerned that the Draft CHS Framework does not include any crediting for renewable gaseous fuels as part of Massachusetts' building decarbonization solution. This decision intentionally ignores renewable gas technologies which are available today, and are proven to provide multi-sector GHG reduction and other environmental benefits. **We are simply requesting that renewable gases be included alongside other fuels in Massachusetts Clean Heat Standard program.**

*Use of Renewable Gas Does Not Preclude Building Electrification*

RNG Coalition supports the development of a Clean Heat Standard as an important policy for decarbonizing Massachusetts existing building stock, including where fossil fuels are currently used to supply gaseous and liquid end-uses. The Commonwealth is right to prioritize emissions reductions from the built environment immediately given its prominence as an emissions source and the complexity of eliminating those emissions. In this case, the exclusion of renewable gases appears to be based on the assumption that end-use electrification is the only necessary solution for full gas sector decarbonization. Here it is important to consider that the portions of the gas system which currently serve the residential and commercial customers targeted for electrification will remain in place for a very long time, even with aggressive fuel-switching policies, and would be well-served by increasing renewable gases while that transition occurs. We are not aware of any studies which predict that electrification of the residential and commercial sectors will occur quickly enough to negate the benefits of renewable gas.

*Summarizing Examples of Jurisdictions with Renewable Gas Strategies*

We believe that DEP's current framework foregoes a significant opportunity regarding the benefit and long-term necessity of renewable gaseous fuels. Renewable gas is a valuable emissions reduction strategy in natural gas-consuming sectors, and will be necessary in the long term in applications that have certain reliability requirements or which are otherwise not well-suited to electrification.[8] The following is a summary recap of strategies which substantiate this concept, expanded upon more in depth in our previous comments:

<u>California</u>

[8] 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

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*.[9] This document recognizes the role renewable gas will play in decarbonization of the gas system and encourages the use of renewable gases to achieve a variety of important environmental benefits. 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.

California Air Resources Board's (CARB) most recent 2022 Scoping Plan[10] outlines the state's pathway to carbon neutrality by 2045. The Scoping Plan includes the following strategies for renewable gases in various sectors:

- In the buildings sector, "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"
- 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"
- 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"

The Scoping Plan includes the following strategies for methane abatement:

- Increasing methane capture at landfills and dairy digesters as a key GHG abatement strategy.
- "[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" in the dairy and livestock sector.

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[9] https://efiling.energy.ca.gov/GetDocument.aspx?tn=242233
[10] https://ww2.arb.ca.gov/resources/documents/2022-scoping-plan-documents

- "[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."

Within California Public Utilities Commission's Long-Term Gas Planning Rulemaking,[11] *Staff Proposal on Gas Distribution Infrastructure Decommissioning Framework in Support of Climate Goals*[12] outlines long-term thinking around renewable gases on PDF pg. 15:

- "Biomethane is among the energy options for hard-to-electrify industries. Biomethane is produced at local sites—such as landfills, wastewater treatment plants, and dairies—that often depend on pipelines to bring their product to customers. In D.22-02-025, the CPUC ordered the gas utilities to procure 72.8 billion cubic feet (Bcf) of biomethane annually by 2030 for core customers to comply with SB 1440 (Hueso, 2018) and SB 1383 (Lara, 2016). 32 Since pipelines are needed to comply with this decision, pipelines that bring biomethane to market should not be prioritized for decommissioning."

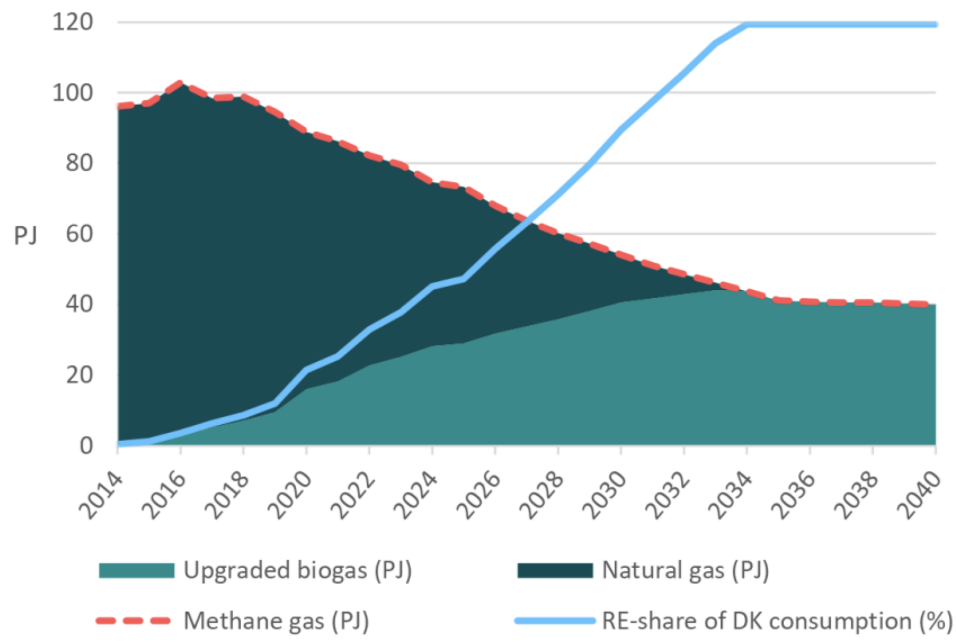
Denmark

The Danish Green Gas Strategy plans for high electrification and significant decommissioning of the gas system, including for most building heating, by 2040. This coincides with a ramp up in biomethane supply until the gas system is 100% renewable, as well as the transition of other parts of the system to transport green hydrogen and $CO_2$. The Strategy envisions a long-term role for biomethane, hydrogen, raw biogas, pyrolysis gas, e-methane (power-to-x), and $CO_2$ transport. The Danes see a large potential for power-to-x, especially to create other bio-based fuels (in addition to the end-uses pictured in Figure 4 below).

Processing organics through centralized anaerobic digestion of different waste types is a key part of Denmark's waste management strategy. This has almost eliminated the need for fossil-based fertilizer; landfilling in Denmark is around 5-6%.[13]

Biomethane is now 37.9% of Danish gas supply. A graph showing growth and a map of facilities is available.[14] Key graphics from the Strategy, including the following, can be found on PDF pages 8-10:

[11] https://www.cpuc.ca.gov/industries-and-topics/natural-gas/long-term-gas-planning-rulemaking
[12] https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/energy-division/documents/natural-gas/long-term-gas-planning-oir/framework-staff-proposal.pdf
[13] https://dakofa.com/element/landfilling-in-denmark/
[14] https://en.energinet.dk/Gas/Biomethane/




European Union

The recent REPowerEU plan calls for a 10x increase in biomethane to 35 billion cubic meters (bcm) of annual production by 2030. The Biomethane Industrial Partnership[15] was created to help achieve this goal. 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 can triple, growing to well over 100 bcm and covering 30-50% of the future EU gas demand. Information regarding each country's potential contribution to the target is available.[16] The European Commission's GreenMeUp project[17] is working to create biomethane development strategies for less developed EU member counties.

International Energy Agency

The International Energy Agency (IEA) previously projected the need for a 27x increase in biomethane in its Net Zero Roadmap. The following are highlights from its 2023 update:[18]

- Gaseous bioenergy, including biogas and biomethane, becomes a highly valuable component of the energy system in the NZE Scenario by 2030, notably in the power sector. This is in part because it is the most cost-effective direct substitute for natural gas, an attribute that has taken on a significant energy security dimension since the

[15] https://www.europeanbiogas.eu/about-us/partnerships/biomethane-industrial-partnership/
[16] https://energy.ec.europa.eu/publications/2023-biomethane-country-fiches_en?trk=feed_main-feed-card_feed-article-content
[17] https://www.greenmeup-project.eu/
[18] https://iea.blob.core.windows.net/assets/2a240ed2-006b-486c-a994-9df5550dce86/NetZeroRoadmap_AGlobalPathwaytoKeepthe1.5CGoalinReach-2023Update.pdf

Russian invasion of Ukraine in early 2022. By 2050, biogas from anaerobic digestors and other production techniques take on a wide variety of roles because it offers one of the cheapest ways to meet rising demand for clean, gaseous fuels for flexible power generation, industrial heat, hydrogen production and, potentially, maritime fuel. In addition, they are able to provide sustainable carbon inputs to hydrogen-based fuels. (page 78)

- The use of biomethane in buildings reaches 75 bcm (2,650 bcf) of natural gas equivalent by 2050. (page 90)
- Average biomethane blending in global gas-fired generation (without CCUS) reaches 1% in 2030 and 7% in 2050. (page 92)
- Biomethane reaches 1% of total final consumption by 2030 and 2% by 2050. In other words, 2% of all energy used globally in 2050 is biomethane. Hydrogen reaches 5% in 2050 and fossil natural gas 4%. The compound annual average growth rate from 2022 to 2030 for biomethane is 42%. From 2022 to 2050, it is 13%. (page 195)

*Tracking Systems Exist and are Ready for Deployment in the CHS*

Tracking renewable electricity, renewable gas, and, potentially, other clean heat measures will be a key design feature of the CHS. The M-RETS tracking system[19] is an independently operated, non-profit platform used for tracking Renewable Energy Credits (REC) and Renewable Thermal Certificates (RTC) in both voluntary and compliance markets. M-RETS is the only renewable tracking system in North America which covers multiple use-cases for renewable gas. Use of the platform continues to grow with an increasing number of voluntary renewable gas transactions in the US, as well as a growing number of programs which use the tracking system for RNG procurement, including for renewable power procurement. To prevent double-counting, create consistency, and save agencies the trouble of designing their own system, DEP should use M-RETS to track and retire clean heat credits under the forthcoming CHS.

*Conclusion*

A CHS program represents an important opportunity to incent the full suite of technologies needed to fully decarbonize Massachusetts' thermal energy load in line with the ambitious climate and environmental goals put forth by the Global Warming Solutions Act.[20] RNG Coalition fully supports the implementation of a CHS in Massachusetts as an important tool for meeting the Commonwealth's thermal decarbonization goals. However, the exclusion of renewable gas from this program would be a major missed opportunity for near-term cross-sector decarbonization and the creation of supply capacity and infrastructure which is expected to play a key long-term role in decarbonizing the economy. With this in mind, we urge DEP to include renewable gases—with specific attention to RNG—alongside liquid biofuels in the forthcoming CHS.

[19] https://www.mrets.org/
[20] https://www.mass.gov/service-details/global-warming-solutions-act-background

Sincerely,

/s/

**Sam Lehr**
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*Via Electronic Mail Only*
climate.strategies@mass.gov

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

December 21, 2023

Subject: MassDEP Clean Heat Standard Framework
Joint Comments by Climate Advocates

Dear Commissioner Heiple,

Below please find comments regarding Massachusetts Department of Environmental Protection's ("MassDEP's" or "the Department's") Clean Heat Standard ("CHS") Framework from environmental and climate organizations dedicated to achievement of Massachusetts' climate policy in an equitable and efficient manner.

## I. Background and Introduction

Massachusetts' proposed Clean Heat Standard is one of several anticipated tools for attainment of the Commonwealth's mandate to achieve net-zero greenhouse gas ("GHG") emissions by 2050, as required by the 2021 Roadmap Law. [1]The idea of a CHS was identified as a response to the need to transition residential, commercial, and industrial heating and cooling to clean energy methods in Massachusetts' 2025, 2030, and 2050 Clean Energy and Climate Plans analysis, which recognized electrification as the best option to meet Massachusetts' climate mandates in a cost-effective manner. Accordingly, the value of different heating types should be based upon the amount of avoided emissions, with non-emitting options being rated the most valuable.

## II. Electrification is the Most Effective and Cost-Efficient Manner of Achieving Massachusetts' Climate Mandates

A Clean Heat Standard, in conjunction with a broader suite of policies regulating appliance emissions standards, is a useful tool to achieve electrification, which is in turn necessary for achievement of Massachusetts' climate policy and the goal of achieving net-zero greenhouse gas ("GHG") emissions by mid-century. Accordingly, the undersigned commend DEP for recognizing the significance of the need for electrification and basing the clean heat standard on electrification, rather than partial and scientifically questionable emissions reductions from alternative liquid and gaseous fuels. By requiring an escalating number of full electrifications and assigning responsible parties a portion of the overall target, the clean heat standard can provide not only a deeply needed source of funding for incentives, but also a regulatory 'stick' to ensure that implementation actually happens.

[1] Mass. Acts 2021, ch. 8.

Key to ensuring effective and equitable achievement of the climate goals, however, is a definition of full electrification that is based on sound reasoning. Developments in heat pump technology have rendered this clean, electrified heating technology effective during typical New England winters and even in temperatures as low as 15 to 20 degrees below zero.[2] Accordingly, buildings with fossil fuel backups for heat pumps should not meet the DEP's criteria for full electrification, particularly for an annual emissions credit over the lifetime of the equipment. Indeed, the Department of Public Utilities Order in docket D.P.U. 20-80 providing a Regulatory Framework for the future of the gas industry (hereafter "20-80 Order") stated that hybrid heating, particularly with natural gas, was not a viable path forward.[3] DEP should also work with MassSave to convert buildings with electric resistance to heat pumps, which would also help to address concerns about the impacts of electrification on load and reliability. However, residential projects converting homes from electric resistance heat to heat pump heat should not count as "full electrification" projects under the CHS crediting definition – as this work is primarily an efficiency measure.

The requirement for full electrification of residential buildings in the Commonwealth should be emulated for commercial and industrial buildings. The alternative to a full electrification program would be a program that relies on biodiesel, a combustible fuel that emits carbon dioxide when burned and with questionable climate benefits outside of a very limited supply of waste oil. This requirement for commercial and industrial buildings would not necessarily require "full electrification" for a set number of non-residential buildings, but rather could be linked to, for example, explicit requirements built into the CHS on total square footage of non-residential buildings primarily heated by heat pumps.

The Commonwealth's pace of electrification must be accelerated beyond the current speed to ensure achievement of Massachusetts' climate policies and goals. Table 2 of the CHS Framework appears to show that the phased-in full electrification requirement will peak in 2040, but there is no clear indication that this pace and timing will achieve the amount of electrification required or why 2040 would be the peak.

The undersigned also seek information on the Department's basis for determining that obligating electricity suppliers will help ensure the longevity of the program, as well as the program duration anticipated to be necessary to achieve success. There is no evidence or rationale offered that sufficiently supports the inclusion of retail electricity suppliers as obligated entities along with suppliers of methane gas and delivered fuels. The purpose of a CHS is to drive a shift from combustion to electrification. Raising the cost of electricity, which is becoming less carbon intensive every day, is counterproductive. The carbon intensity of the electric system is also accounted for under the Renewable Portfolio Standard and Clean Energy Standard. Charging electric customers under the CHS would be both unnecessary and counterproductive.

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[2] U.S. Dept. of Energy, "Residential Cold-Climate Heat Pump Technology Challenge" (Feb. 2022) (available at: https://www.energy.gov/eere/buildings/articles/residential-cold-climate-heat-pump-technology-challenge-fact-sheet)
[3] Mass. Dept. of Pub. Util. Order No. 20-80-B (Dec. 6, 2023) at 55 "The Department is not persuaded that pursuit of a broad hybrid heating strategy that would necessitate maintenance of the natural gas system to support backup heating systems is a viable path forward." (available at: https://fileservice.eea.comacloud.net/FileService.Api/file/FileRoom/18297602).

Within the bounds of what has been proposed, we also question the rationale for proposing to obligate retail suppliers of electricity rather than electricity distribution companies.

**III. MassDEP Must Demonstrate that Incorporation of Alternative Fuels into the Clean Heat Standard is Based on Sound Data and Analysis and Will Result in Achievement of Massachusetts' Climate Mandate.**

As proposed, the Clean Heat Standard Framework anticipates a significant role for delivered fuels, especially biofuels, in home heating. The DPU's 20-80 Order noted that there simply has not been an adequate showing to demonstrate that there is a role for alternative fuels such as biomethane (also known as "renewable natural gas" or "RNG") or hydrogen, regardless of the underlying feedstocks. The same concerns raised by the DPU regarding the availability, emissions reduction potential, and high cost of gaseous biofuels also apply to liquid biofuels. It has not yet been shown that production of drop-in alternatives with any credible climate claims to fuel oil and propane will be scalable, and price volatility is unknown. Accordingly, Massachusetts must focus its efforts on electrification, which will free homeowners from reliance on polluting and volatile fuels.

Additional information is required as to how DEP intends to handle oil and biofuels in its CHS. As it stands, the Framework would appear to generate a discrepancy between small homes and apartments and large homes that would lead to many more of the former being electrified, but many of the latter switching to biodiesel to earn full value for the emissions reductions. As larger homes generally emit GHGs at a more significant rate and amount, the emissions credit structure of a set value per unit will work against the desirable near-term transition of these homes to a cleaner option, i.e. electrification. Further, we read the Draft Framework Section II.B to potentially indicate that fossil fuel sellers' compliance with the emissions reduction requirement would only be met through biofuel blending—if this is the intended reading, this must be expanded to include electrification and installation of heat pumps.

The Department must base its decisions as to which heating methods will qualify for credits under the Clean Heat Standard on sound data and analysis as to the cost, scalability, and emissions potential of each resource. For example, it has not yet been made clear that so-called "renewable propane", derived from refined organic feedstocks such as animal fat and vegetable oil, is a cost-effective fuel.[4] Like other biofuels, renewable propane has also not been shown to be scalable due to the significant amount of resources it takes to produce and the limited amount of animal fat, vegetable oil, and other biological feedstock available to produce renewable propane.[5] The Department should also consider the implications of having to develop additional infrastructure for a resource that has not been demonstrated to be cost-effective or scalable, including the potential environmental impacts of production, distribution, and combustion.

The Department must be careful to not succumb to the greenwashing tactics currently and historically used to paint resources such as biofuels as helpful to Massachusetts' climate

[4] Katan, Carrie, "Renewable Propane: A Reality Check", Nov. 16, 2023 (available at: https://blog.greenenergyconsumers.org/blog/renewable-propane-a-reality-check).
[5] Id.

mandates. Although these fuels are "renewable" in that they can be produced from biological feedstock that is replenishable, they are combustible fuels with highly uncertain GHG impacts from a lifecycle perspective that also emit other criteria air pollutants.

## IV. The Clean Heat Standard Must Be Designed to Promote Equity and Environmental Justice Considerations.

The current CHS Framework attempts to incorporate environmental justice considerations in several ways and presents a commendable start but must be improved. A properly designed "just transition fee" could help to supplement an equity carve out. The undersigned request additional projected data on the cost benefits that would arise from the DEP's CHS to low- and moderate-income consumers. Additionally, we request that the Department provide quantification to support its proposal to consider every home as emitting 5 MT, especially as to the reasoning for having a universal emissions amount for all residences and the potential impacts of choosing not to tie this amount more closely with income and environmental justice considerations. Further, if the Department seeks to verify use of a hybrid or "full electrification" system with backup combustion systems in place, electricity consumption data must be used to calculate the actual emissions reductions.

The CHS describes a "just transition fee" that market rate customers would contribute to via electrification projects or alternative compliance payments. Any mechanism that seeks to redistribute funds from customers receiving electrification measures should be charging as much or more to liquid fuel customers. It is also worth determining what forms of funding assistance – e.g. bill assistance, up-front incentives, or other mechanisms – will be provided to customers. The undersigned recommend mechanisms that are user-friendly and simple to understand; enrollment in any funding assistance programs should be automatic for qualifying customers such that benefits are not missed. Finally, the Department should work with DPU and DOER to ensure the eligibility criteria for assistance is expanded beyond a strict "low income" range tied to the residential electric discount rate to a definition that reflects the lived reality of Massachusetts residents who are low and moderate income (up to 120% SMI).

## V. A Clean Heat Standard Should Award Clean Heat Credits to Heat Pump Water Heaters, Induction Stoves, and Clothes Dryers

We understand that DEP has focused the framework on space heating for the sake of simplicity. However, we recommend that the standard allow other Mass Save-assessed electrification equipment like heat pump water heaters, induction stoves, and clothes dryers to generate emissions reductions credits (and to be essential criteria for receiving full electrification credits) for several reasons. First, including those appliances would result in significant emission reductions over time. By contrast, excluding them would help to lock in combustion appliances, and the gas distribution lines needed to support them, for many more years than necessary. Second, including those appliances would diversify the supply chain that the standard would depend on. Third, including those appliances would contribute to equity insofar as replacing combustion appliances with electric appliances could be within reach of consumers who may not be ready for whole house heat pumps. Fourth, there are significant indoor air quality benefits associated with electrifying those appliances. Fifth, full gas pipeline segment decommissioning will only be possible when all appliances are transitioned from gas. Finally, it is not clear how the CHS can meet the 24 MMT CO2e reduction in the building sector by 2050 if water heating, which accounts for approximately 23% of building sector emissions, is not covered by the program.[6]

## VI. Additional Information is Needed to Evaluate the Adequacy of the Clean Heat Standard Program Design

As noted above and reflected in our letter of December 6, 2023, additional information is needed on multiple key issues presented in the CHS Framework. The undersigned request additional information on how the CHS will handle administration and allocation of alternative compliance payments ("ACPs"). For example, will MassDEP be responsible for collecting and allocating funding derived from CHS ACPs, or will the Department engage a third-party entity such as the Massachusetts Clean Energy Center? Concern remains as to the pacing of electrification for the Commonwealth and the undersigned seek revision and/or explanation of the tables contained in the CHS Framework to provide clarification on how the CHS is expected to impact the pace of electrification and heat pump installation.

Thank you for your time and attention to this matter. We look forward to continuing to engage on this matter and welcome any questions or additional dialogue.

Respectfully submitted by:

Ben Butterworth
Director: Climate, Energy & Equity Analysis
*Acadia Center*

Amy Boyd Rabin
Vice President of Policy
*Environmental League of Massachusetts*

Priya Gandbhir
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With support from:

Cabell Eames, *Belmont Resident*
Jacqueline Royce, *Boston Resident*
T. Stephen Jones, MD, MPH, *Northampton Resident*
Carolyn Barthel, Executive Committee Member, *350 Mass*
Charles Lidz, Vice Chair, *Ashland Sustainability Committee*

[6] The Cadmus Group, et al., "Buildings Sector Report: A Technical Report of the Massachusetts 2050 Decarbonization Roadmap Study", (Dec. 2020) at 9. (available at: https://www.mass.gov/doc/buildings-sector-technical-report/download).

Rosemary Wessel, Program Director, *No Fracked Gas in Mass*
Bob Armstrong, Co-Chair, *FCCPR Climate Crisis Task Force*
Stephan Roundtree, Jr., Deputy Program Director, *Vote Solar*
Jess Nahigian, State Political Director, *Sierra Club Massachusetts*
Claire Karl Miller, Movement Building Director, *UU Mass Action*
Laura Haight, U.S. Policy Director, *Partnership for Policy Integrity*
Kathryn Eiseman, Policy Advisor, *Partnership for Policy Integrity*
Anne Wright, Co-Founder, *MA Building Electrification Accelerator*
Jane Winn, Executive Director, *Berkshire Environmental Action Team*
Lucas Duval, Air Quality Monitoring Project Manager, *Breathe Easy Berkshires*
Rev. Cynthia Davidson, Executive Director, *Massachusetts Interfaith Power & Light*
Sallye Bleiberg, Advocacy Subcommittee Chair, *Brookhaven Residents' Climate Change Committee*

## Parnay, Angela L (DEP)


**From:** Susan Cornett <Susan.Cornett.633646547@p2a.co>
**Sent:** Thursday, December 14, 2023 11:12 AM
**To:** Strategies, Climate (DEP)
**Subject:** Please Consider the Impact of the Clean Heat Standard on Residents of Massachusetts




Dear Department of Environmental Protection members, As a Massachusetts resident, I am writing to express my concerns regarding the DEP's Clean Heat Standard. While I strongly advocate for climate action, forcing Massachusetts residents to phase out and replace their biomass, natural gas and propane heating by increasing the cost of fuel does more harm than good. This plan is essentially a tax on all Massachusetts residents without the assurance of emission reductions. The CHS completely ignores the carbon intensity of electricity generation from the grid while simultaneously excluding biomass, which qualifies for a federal tax credit in the Inflation Reduction Act. In fact, the CHS draft framework states that "standards would be inclusive of clean heat supported by other programs, such as federal tax credits." We agree with these inclusive standards. With that tax credit, we recently purchased the best, lowest emission woodstove available to reduce the high financial and environmental cost of burning oil. The federal Biomass Tax Credit, included in the Inflation Reduction Act, strengthens our case that biomass should be included in the Clean Heat Standard. The forced electrification of the CHS jeopardizes residents' ability to choose affordable, reliable heating. Furthermore, while we support increased electricity generation through solar, we're concerned about the practice of installing solar farms on valuable cropland and by clearcutting forests. In our area, large energy companies are bypassing small town ordinances and getting the state and courts to back their plans to install such solar farms and battery stations against residents' will and without reason. Solar should be installed in already developed areas such as rooftops and parking lots. There are ample parking lots all over the state to meet the state's goals. In your capacity, and as representatives of Massachusetts, please think about the impact of the CHS on small businesses, jobs, Massachusetts residents, and consumer choice. Please revise the Clean Heat Standard to include more affordable home heating options. Thank you. Sincerely, Susan Cornett

Gregory Cox
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Hawley, MA 01339
(413) 339-5526
gcox@crocker.com

December 19, 2023

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

RE: Proposed Clean Heat Standard

Good Morning:

This letter is to urge DEP to include modern wood heat systems and pellet stoves in the Massachusetts Clean Heat Standard.

Massachusetts' Climate Plan seeks to have net zero greenhouse gas emissions by 2050 with the most critical reduction in such emissions by 2030. To reach this goal, <u>we need to eliminate the use of fossil fuels in building heat as quickly as possible</u>. But the experience of the past few years is that, even with substantial cash incentives, most building owners are reluctant to change their heating systems to heat pumps due both to the major investment involved and the very high costs for electricity in the Commonwealth.

Modern wood heat systems are highly efficient whole building heating systems that use processed wood fuels, either manufactured wood pellets or partially dried wood chips, that feed automatically to generate heat as needed. These systems provide cost effective heat with minimal emissions, allowing the replacement of fossil fuel systems in buildings and substantial immediate reductions in greenhouse gas emissions.

Pellet stoves burn low ash, manufactured wood pellets to provide cost-effective low-emission heating for smaller spaces with similar reductions in greenhouse gas emissions from fossil fuels.

These automated wood heat systems not only eliminate greenhouse gas emissions by substitution for fossil fuels such as heating oil, propane or natural gas, because they are using wood residues, they also reduce uncontrolled existing emissions from these materials. Given that Massachusetts alone generates more than 3 million tons of waste wood from power line maintenance, storm cleanup and tree trimming each year, these wastes emit 1.5 million tons of greenhouse gases per year, much in the form of methane.

For those reasons, a national study found that switching a building from fossil fuels to modern wood heat would result in an immediate greenhouse gas reduction of 60 percent or more. The Massachusetts Clean Energy Center found in 2020 that there was a greater carbon reduction from switching buildings to modern wood heat than would be achieved by switching them to heat pumps, due to the fact that during the heating season 70% of Massachusetts' electricity supply is generated with fossil fuels (primarily natural gas).

If you want to understand how this accounting is done, the Alliance for Green Heat is holding a webinar on *Carbon Accounting for Modern Wood Heat* on January 17th at noon (see https://us02web.zoom.us/webinar/register/WN_Zf7WiK-HRrafIUvLF-zxnA#/registration ).

About 10 years ago, the Mohawk Trail School System wanted to find a way to replace aging oil-fired boilers used to heat two of its elementary schools: Hawlemont Regional in Charlemont and Sanderson Academy in Ashfield. Using state grants, they installed 3 pellet boilers at each school, along with thermal storage, the storage bins and auger systems to feed the chips. The pellet boilers helped the schools reduce oil consumption by more than 50,000 gallons annually, allowing them to put the money saved into educating students. A subsequent air monitoring study by UMass researchers found that not only did the switch to pellets save fuel and money, it also resulted in substantially lower overall emissions from the schools than the oil boilers.

If Massachusetts is to meet its goals for transitioning to non-fossil fuel building heat sources by 2030, it must recognize that the state's Decarbonization Roadmap grossly underestimates the costs of such transitions and the amount of work they will entail. As Senator Brownsberger wrote recently in *Commonwealth Magazine*
(https://commonwealthbeacon.org/opinion/mass-decarbonization-roadmap-radically-underestimates-costs/
), the Roadmap's estimate of the average cost to convert residences to heat pumps of just $7,500 per structure is totally unrealistic. The real cost is somewhere north of $20,000 per home and many larger structures, particularly in rural communities, may cost $50,000 or more to convert. Even with state subsidies, this kind of extra cost is beyond the reach of most homeowners, which is a major reason why despite high rebates, the state got just 30% of the 100,000 heat pump conversions it set as an annual target.

Adding to exorbitant capital cost is the fact that Massachusetts has the highest electric rates in the nation. No matter how you slice it, converting from fossil fuels to electric heat pumps will drastically increase the amount of electricity you use, and because air source heat pumps must run very hard when temperatures drop below 20 degrees, the bill goes up even more.

By contrast, because there are so much wood wastes generated each year, wood pellet and dried chip prices are very stable. For those homes and businesses that convert to a form of modern wood heat, their winter fuel bills generally drop compared to their previous fossil fuel costs. That is why, even without state subsidies, homeowners put in wood and pellet stoves to supplement their heating systems – they can stay warm and save money at the same time.

While Massachusetts is an urban state, 40 percent of the 351 communities have less than 10,000 population, including many communities with low per capita income, particularly in central and western regions. These communities have many residents with low or fixed incomes who cannot afford the costs of converting to heat pumps or the added cost of running them.

Because Massachusetts has a diverse population with different financial capabilities, we need more than a one-size-fits-all approach to getting as many buildings off reliance on fossil fuel heat. What works in wealthy Boston suburbs isn't often practical in the more rural communities in central and western Massachusetts. If we don't provide a diversity of options for transitioning away from fossil fuel heat, we will continue to miss the state's targets for transitioning away from fossil fuels. As President Obama said, "don't let the perfect be the enemy of the good".

For that reason, I urge DEP to include modern wood systems and pellet stoves in the Clean Heat Standard. They provide important options for homeowners and businesses where heat pumps aren't financially practical.

Sincerely,

Gregory Cox

Cc: Representative Natalie Blais
Senator Paul Mark

## Parnay, Angela L (DEP)

**From:** steven curylo <achoo2you@gmail.com>
**Sent:** Thursday, December 14, 2023 4:33 PM
**To:** Strategies, Climate (DEP)
**Subject:** Pellet stoves



Why are citizens being forced to electric heat! Who is profiting! I went to wood pellets for a warmer heat that is tons cheaper than electric. Last year's electric heat costs put most people in the poor house. But alas politicians only care about their special interest groups who control and paid for their votes. Carbon debate crap is just that crap! If people can't afford heat does that male you happy, it seems you clowns get off on forcing people against their will to fall in line with your controllers, who sure aren't the voters. A freezing and going broke voter is not a statistic, but a real thing. One concerned citizen and voter Steven Curylo.

Dec 21, 2023

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

**Feedback on Draft Clean Heat Standard Framework**

Divert is an impact technology company with a mission to protect the value of food. Based in Concord, Massachusetts, we were founded on the purpose of creating innovative and efficient solutions toward eliminating food waste. We are passionate about proving that environmental sustainability can be as good for business and consumers as it is for the planet. To that end, Divert is focused on decarbonizing unconsumed food through source reduction, food rescue, and recycling.

We work toward our purpose every day, and have achieved successes such as:

- Using our technology platform to optimize the reduction of food waste generation for the retail food industry, which is the largest generator of food waste in the U.S.
- Cultivating partnerships with retailers and food banks to increase donations for unsold food that meets food donation guidelines but would otherwise be bound for the landfill.
- Establishing ourselves as the largest anaerobic digestion processor of food waste in the U.S., converting food waste to renewable natural gas via proprietary liquefaction and anaerobic digestion.

Divert is committed to helping Massachusetts reduce the amount of wasted food sent to landfill through the rescue, recovery, and recycling of food waste. As Massachusetts continues to find solutions to achieve its food waste reduction and carbon neutrality goals, Divert is:

- Partnering with Feeding America, local food banks, and a private retailer to service partner stores to identify and facilitate the rescue of unsold food to provide to local communities and families in need.
- Providing Massachusetts food retailers access to Artificial Intelligence (AI) and Internet of Things (IoT) technology to maximize source reduction and improve the proper handling and freshness of perishable goods.
- Expanding food waste processing and anaerobic digestion capabilities in the Northeast United States with a desire to develop a new state of the art food waste to energy facility that makes carbon negative renewable natural gas (RNG) located within Massachusetts.

We respectfully submit the following comments in response to the December 21, 2023 request for feedback on the Department of Environmental Protection's (DEP) Clean Heat Draft Rule.

**Ensure that Massachusetts is pursuing a well-rounded approach to achieve the goals it has outlined in its Massachusetts Decarbonization Roadmap by including renewable gaseous fuels in the crediting program.**

Massachusetts has become a leader in the effort to decarbonize its power-grid and ensure that the state is actively adopting carbon-friendly technologies that are aimed at reducing harmful greenhouse gas emissions. As outlined in the Massachusetts Decarbonization Roadmap, Massachusetts is committed to achieving Net Zero greenhouse gas emissions by 2050, meaning that the state has to take ambitious steps to ensure that green technologies are in place to meet that goal.[1] As part of that goal, Massachusetts has issued the draft framework for its upcoming Clean Heat Rule. As written, the draft does not include crediting for any renewable gaseous fuels within the program. Instead, the draft framework only permits full electrification projects, hybrid systems that retain fossil fuel backup, and documented delivery from eligible liquid biofuels.

While this is an incredible start to pursuing full decarbonization of the state's power grid, it is important to note that by excluding additional renewable gaseous fuels from crediting the state is:

1) Signaling that state-of-the art solutions aimed at helping the state meet it's organic waste reduction goals may have difficulty scaling within the state;
2) Overlooking opportunities to decarbonize the natural gas pipeline, therefore further potentially missing out on additional greenhouse gas reduction efforts;
3) Missing out on timely decarbonization opportunities of hard-to-electrify sectors that can utilize readily available clean renewable gas technology.

In October of 2021, DEP issued its final 2030 Solid Waste Master Plan. In its plan, it established a goal to reduce disposal statewide by 30% by the year 2030, and more specifically, it established a goal of reducing food and other organic materials by an additional 500,000 tons annually by 2030, based on a 2018 baseline of 280,000 tons of food waste reduction.[2] While DEP has indicated that they are well suited in regards to having the capacity to manage its increased diversion efforts with the 2022 expansion of its organics diversion mandate, it will be crucial to look at anaerobic digestion solutions as the state aims to reach its 2030 goals.

At Divert, we help prevent food waste from ever reaching the landfill by processing this waste into pipeline-ready renewable natural gas via anaerobic digestion. We then work with utilities to

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[1] Massachusetts Executive Office of Energy and Environmental Affairs. (2020, December). *Massachusetts 2050 Decarbonization Road Map*. Retrieved December 17, 2023, from https://www.mass.gov/doc/ma-2050-decarbonization-roadmap/download

[2] Massachusetts Department of Environment. (2021, October). *Massachusetts 2030 Solid Waste Master Plan: Working Together Toward Zero Waste* . Retrieved December 17, 2023, from https://www.mass.gov/doc/2030-solid-waste-master-plan-working-together-toward-zero-waste/download

inject this gas directly into the pipeline, helping to offset a need for fossil based fuels. As the state reduces the reliance on natural gas for homes and businesses, the carbon negative renewable natural gas from Divert's operations will ensure that hard to electrify industries can access this energy as we decarbonize the utility grid. These operations help to create a truly circular solution for processing food waste, ensuring the energy created from our product is put to its most efficient use.

Divert's operations help ensure that the organic waste generated by the DEP's organics diversion mandate has an opportunity to be processed in a way that has the lowest environmental impact. The organics diversion mandate requires waste generators that generate more than ½ ton of food waste per week to divert this material from the landfill. This mandate impacts commercial wasted food generators (food retailers, restaurants, hotels, convention centers, etc.). There is a general consensus in the solid waste industry that anaerobic digestion is the preferred way to treat commercially generated wasted food. Commercially generated wasted food can disrupt composting operations due to its high moisture and contamination levels. Companies that operate wasted food digesters like Divert have equipment that are able to remove plastics and packaging material. In contrast, when a compost facility is required to accept commercial food waste, it is very challenging to keep compost material free of contamination and a finished product is created that contains microplastics which are then spread across the state under the guise of "creating healthy soil". The creation of renewable natural gas from anaerobic digestion enables the collection and diversion of commercially generated wasted food to be accomplished at scale, so having an outlet for this carbon negative fuel is critical in ensuring that the DEP can meet its organics diversion mandate.

The EPA recently introduced its latest research on wasted food reduction pathways. The report notes that after source reduction and feeding others, "Stand-alone" anaerobic digestion (i.e. separated food waste without yard waste, manure, or human wastewater) where its digestate byproduct is added to compost for land application has the least amount of environmental impact when compared to composting alone and others on the least preferred side of the wasted food scale.[3] The new EPA report specifically explains why "Stand-alone" anaerobic digestion ranks higher than composting in its "purity" circularity assessment, and how all types of anaerobic digestion rank higher than composting in its life cycle assessment of energy demand, particulate matter formation, human toxicity, ecotoxicity, eutrophication (nutrient impact on water), acidification (impact on terrestrial environment), and global warming potential. "Stand-alone" anaerobic digestion incorporates the best elements of digestion and composting into a single wasted food reduction pathway. The new EPA report validates Divert's decision to

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[3] United States Department of Environmental Protection. (2023, October). *From Field to Bin: The Environmental Impacts of U.S. Food Waste Management Pathways (Part 2).* Retrieved December 20, 2023, from https://www.epa.gov/land-research/field-bin-environmental-impacts-us-food-waste-management-pathways

deploy this pathway nationally on a commercial scale, alongside source reduction and food donation.

In addition to the need for the state to allow for crediting of renewable gaseous fuels to meet its food waste reduction goals, it is important to understand that by leaving renewable gaseous fuels out of the crediting program, the state is overlooking immediate opportunities to decarbonize the natural gas pipeline today, while meeting its organics diversion mandate. Clean technologies aimed at reducing emissions in this sector are readily available to be implemented and scaled and have been proven to provide multi-sector greenhouse gas reduction. Increased use of these fuels, alongside electrification and biogas, serve as tool to use across sectors by increasing clean fuel supply, capturing and utilizing methane emissions from organic waste streams, and enabling circularity in Massachusetts' economy through recycling, the creation of bioproducts, and carbon sequestration. While it is important to push towards electrification for many residential and commercial end uses, this transition will be a lengthy process that requires states to also implement short term decarbonization efforts. Decarbonizing the natural gas pipeline in existence by utilizing renewable gaseous fuels would serve well in helping the state to reach decarbonization quickly while scaling electrification efforts.

Massachusetts needs to look at decarbonization from a holistic perspective, utilizing a wide variety of decarbonized fuels. Renewable gasses will need to remain a necessary component of any decarbonization strategy, especially in hard to electrify sectors such as concrete production and heavy industry. By including renewable gaseous fuels in the Clean Heat Standard, Massachusetts is creating a means to continue to scale these necessary technologies and realize their environmental benefits now. Use of renewable gasses for these end uses does not preclude other measures of reducing fossil gas consumption, such as electrification or energy efficiency.

We understand that the final Clean Heat Regulation will include a requirement to consider expanding eligibility to other fuels in a required 2028 program overview, however that timeline leaves little room for Massachusetts to implement and scale technologies that will truly help the state reach its various decarbonization and waste reduction goals. Instead, by ensuring that renewable gaseous fuels are included within the crediting program within the Clean Heat Rule, the state would be signaling its commitment to achieving net zero emissions by 2050.

**Conclusion**

By considering the above recommendations, DEP staff has the opportunity to inspire further innovation in the renewable fuel sector while ensuring that the state does inhibit its ability to truly decarbonize across sectors.

We would welcome an opportunity to discuss these suggestions further and additionally talk through our operations to provide further context to our suggestions. If you have any questions, please do not hesitate to contact me at cthomas@divertinc.com or at 202-421-1107. We are eager to collaborate further on this critical effort.

Sincerely,

Chris Thomas
Vice President of Public Affairs
Divert Inc.

## Parnay, Angela L (DEP)

| | |
|---|---|
| **From:** | Michael Duclos <mduclos1@icloud.com> |
| **Sent:** | Tuesday, December 26, 2023 12:37 PM |
| **To:** | Strategies, Climate (DEP) |
| **Cc:** | Michael Duclos |
| **Subject:** | Comments on the Draft Clean Heat Standard |



Thank you for the opportunity to provide comment on the current draft proposal for the Mass. Clean Heat Standard, hopefully you will find some of these comments helpful.

**Residential Domestic Hot Water** (DHW) is a significant portion (e.g. ~15%) of the total energy use of a typical home, it often uses the same fossil fuel as space heating, so I see it as important to include in the Clean Heat Standard. If this is not done, how will the electrification of residential DHW be properly promoted and tracked ?

I appreciate the desire for program simplicity, but this is important to implement, as well as providing data on how well the CHS process is delivering, so that that process can be modified informed by real world experience. I know of a number of cases in which space heating was fully electrified, but DHW remained on natural gas or oil afterwards, it is not a given that converting space heating to electricity will result in the conversion of DHW to electricity. Based on personal experience the transition to HP DHW is being impeded by plumbers who do not understand or want to learn about them, and so are actively guiding homeowners to other equipment. I see this as a much different situation than that with ASHP installers who have a well developed business model installing ASHP from which they profit. HP DHW clearly needs a 'push,' I think the CHS needs to do this also.

**Backup Heat** – I see a serious conflict between current standard practice guidelines, as well as the requirements of the 2024 Mass Save incentive program that mandates space heating equipment for Full Electrification incentives be done by sizing ASHP for 90% to 120% of the calculated heating load at design temperature, and removal or disabling of fossil fuel backup heat.

I say this as someone who has for years heated a 2500 sf Mass. home with a single 9 Kbtu/hr ASHP, using a small amount (~40 gal. in 2023) of fuel oil for peak load management, and who has recommended and monitored the real world performance of many ASHPs.

Blindly following this MassSave guidelines is resulting in unforeseen, unintended consequences, in a variety of ways.

If fossil fuel use is disallowed for backup (as it currently is for 2024 MassSave 'full electrification' incentives homeowners are chasing) in the event of an ASHP failure, or a low temperature event (e.g. less than -15F) NO heat will be supplied by the ASHP. Responsible ASHP installers do not want to be called on an emergency basis by an unhappy client whose home is freezing. So most responsible installers currently either tell their clients to keep their fossil fuel space heating equipment operational and forgo the 'full electrification' incentive, or will install a massive amount backup electric resistance heat, frequently resulting in an expensive electrical panel upgrade. For a typical MA home the amount of backup electric resistance heat (e.g. 15 KW) alone could require a 50-70 amp 240 VAC circuit breaker when properly derated according to the electrical code. This massive amount of resistance heat complies with, and is currently implicitly encouraged by the 2024 MassSave 'full electrification' incentive requirements, which requires either removing or disabling existing fossil fuel space heating equipment.

You should appreciate that repair of an ASHP in winter weather conditions is an entirely different matter from repair of fossil fuel equipment which is located indoors. This because the ASHP failure is almost always happens in the Outdoor Unit, so access for repair is fully exposed to the weather.

Think about what it means to attempt to troubleshoot and successfully repair a complex electro-mechanical system using delicate refrigerant management equipment outdoors in full winter conditions.

Better yet, speak with an experienced installer who can tell you exactly why and how they recommend a system they can stand behind for service for the lifetime of the equipment. There are 'installers' out there that only install, and do not repair what they sell, they offer lower prices to consumers by using shortcuts that can leave a real mess for someone to deal with in poor weather. They will, for example, install a single multi-zone outdoor unit, without backup electric resistance heating to obtain the 'full electrification' incentive for the client, then fail to deal with the consequences of an equipment failure.

Experienced, responsible installers know of the variety of challenges in dealing with ASHP repair in winter because they directly feel the pressure from their clients to keep their homes warm. Blindly going down the path of 'Full Electrification' has the potential to cause a number of issues, including backlash stories that will inhibit adoption, and bad press.

Consider the case of a lengthy polar vortex event causing many ASHP to provide insufficient output and potentially shut down for several hours per night concurrent with the peak heating load, that backup electric resistance heat comes on, everyone stays warm and thinks the ASHP is working - but it isn't. I've seen things like this first hand when the only notice of a non-functioning ASHP was when the monthly electricity bill arrives.

I'm concerned the effects of last year's sub-zero weather (2/4/2023) were mitigated by a substantial use of electric resistance heat, while people thought their ASHPs were solely responsible for serving the load, as reported by an uninformed media.  This means the low COP of electric resistance heat presented a very large additional electrical load to the grid. At current market penetration volume that was not an issue – but if the CHS succeeds in widespread adoption as planned, it is a very significant issue.

Vermont has considered the issues around pushing people into eliminating fossil fuel heating entirely and has carefully considered a different approach. Since **Full Electrification** is a prime focus of the current CHS draft, it is important to understand all the potential implications of this requirement before wide scale deployment. Without some sort of accommodation for allowing occasional use of existing fossil fuel equipment, there may be substantial resistance to Full Electrification as a result, or a serious reduction in resilience, particularly in the case of a single ASHP point of failure. In addition, installers navigating the torturous path to MassSave incentives will take the only avenue open to them when clients pressure them for the 'full electrification incentive' - very large electric resistance back-up, rather than simply leaving the fossil fuel equipment in place and operational at essentially no cost.

A better approach would be to allow occasional, modest use of fossil fuel heating, not only for this scenario, but additionally and importantly so that ASHP can be selected to avoid 'short cycling,' which will both increase homeowner electricity costs and increase emissions. The current proposal apparently fails to recognize that modern Cold Climate ASHPs do not have the 'dynamic range' or 'turndown ratio' to satisfy the demands of temperature extremes of our climate without some sort of backup strategy. The simple-minded slogan that ASHPs sized to between 90% and 120% of the calculated heating load are sufficient under all weather conditions is simply incorrect. "Oversizing" per se is not the problem. Improperly selecting ASHP to serve the load profile of the individual home is, but simple-minded MassSave guidelines fail to recognize this.

The issues caused by a single-minded pursuit of a 'full electrification' strategy should be investigated in detail and appropriate solutions devised rather than just blindly relying upon what MassSave has put in place. Apparently it will be necessary to track all fuels anyway, so limiting the use of these fuels to very specific peak load or equipment failure situations can be policed using that data, perhaps by random audits to which homeowners must agree for the 'full electrification' incentive. This verification is particularly easy in the case of natural gas with centralized monthly bills.

If 'full electrification' with no fossil fuel backup is to be implemented at scale, then the consequent generation, transmission and distribution issues should be estimated and faced NOW, rather than realizing at scale a system that has serious problems down the road and then trying to fix them – we simply do not have the time or resources for massive 'rip up and redo,' we should be planning now for the future we will all live in.

The current MassSave 'crossover temperature' control strategy for switching dual fuel systems from HP operation to fossil fuel operation should be changed to a control strategy that only uses the inability to deliver sufficient heat to switch to fossil fuel heating to minimize fossil fuel heating use. If you don't understand why, investigate this in detail, don't blindly follow MassSave rules.

Incentives to change behavior must be very carefully designed, or undesirable outcomes can be realized.

If the implications of the CHS program are not carefully considered and operating rules carefully crafted there could be serious implications for grid reliability and infrastructure cost, as well as creating unnecessarily high ASHP installation costs due to the installation of massive amounts of electric resistance heat, if a small amount of backup heat from existing fossil fuel systems is excluded.

Dismissing the impact of program design decisions on the reliability and cost of the future electricity grid as being 'not in the scope' of the program will surely be severely criticized when the impact is realized, and justifiably so. This compartmentalization of responsibility will be discovered eventually, likely after it becomes very expensive to correct damage done.

**Clean Heat Credit Compatibility with other Incentives** – Compatibility with other incentive structures (e.g. MassSave, its' potential successor program, Federal Tax Credits, etc.) should be carefully considered since very large sums of money are in play, and in order to maximize the leverage of these monies to the goal of electrification they should be complimentary, and certainly not mutually exclusive. The need for a mechanism to help insure maximum value is extracted from these expenditures should be explicitly stated and considered, particularly with respect to any specific requirements for mechanical systems.

**Thermal Enclosure Improvement Credits** – The cleanest, least expensive, least polluting heat is that which is never used. Thermal enclosure improvements remain for the lifetime of the building saving emissions each year, in addition to making the building more resilient to power grid failures.

I appreciate the interest in 'keeping things simple,' however we should all appreciate that the reason we in such a difficult position now is that our buildings leak so much heat. So we should acknowledge this, and behave differently in the future. The desire to 'keep things simple' is a large part of the reason we are in the situation we currently face.

For new construction there is a very simple way to determine the quality of the thermal enclosure and so the quantity of saved heat, that is to use the computer model that is constructed for a Certified HERS Rating as required by ~300 Mass. cities and towns that have passed the Stretch Code requirement for a HERS Rating to generate a simple figure of merit, e.g. BTU/SF of living space at design temperature, and use that to qualify the home for Thermal Enclosure Clean Heat Credits. The HERS model is also constructed for MassSave New Construction program incentives, as well as enforcing Mass. Building Code, because it is a trusted, 'investment grade' metric. Passive House Certification is another, much more desirable route, as it is the only building efficiency standard specifically designed to address Climate Change.

In a similar manner, existing homes can have a Certified HERS Rating done, and this is also done for Building Code compliance and MassSave Major Renovation incentives. I believe we badly need to get away from limited and poorly quantified language like 'weatherization' and get serious about wasted heat in buildings.

**Fuel Cost Increase Following Electrification**

Assuming a realistic ASHP COP in the range of 2.0 to 2.5 (depending on system specifics), at current IOU supplied electricity and natural gas pricing, the operational cost of converting to ASHP is substantially greater than continued use of natural gas, with which the homeowner is both familiar and comfortable. While fuel assistance can be considered for low-income homes, there needs to be a practical, durable, credible and scalable mechanism to, at a minimum, insure those converting to ASHP do not experience an increase in operational cost. If this is not adequately addressed, this easily foreseeable conclusion could well cripple deployment of a Clean Heat Standard for these homes. I believe if this is not addressed in the initial deployment of the CHS, it will fail to function as intended for a large number of Mass. homes, sufficiently large the program will be seen as a failure.

The question will be asked of those designing the Clean Heat Standard how much additional fuel cost is estimated when the program becomes operational in 2026, and each year afterwards.

Answering this question now by use of an appropriate quantitative estimate informed by those with experience in 'market transformation' should prove very useful in guiding the design of the program going forward.

Public acceptance of the additional fuel cost is an extremely important criteria for the political acceptance of the Clean Heat Standard. A non-quantified response to the question of how approximately much additional fuel cost is expected is not likely to be accepted by most.

Anticipate the questions likely to be asked at program roll-out and answer them now as best you can, and use those questions and answers in guiding program design now. For example, deferring the grid impact of electrification as 'someone else's problem' is not a response that is likely to be well received.

Thank you for the opportunity to provide comment on the current draft proposal for the Mass. Clean Heat Standard, hopefully you will find some of these comments helpful.

Please do not hesitate to contact me if there are any questions, and good luck with the continuing development and eventual roll-out of the Clean Heat Standard.

Best Regards, Michael Duclos

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Electrochaea

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December 21, 2023

Submitted via email to climate.strategies@mass.gov

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

*Re: MassDEP Clean Heat Standard (CHS) Draft Framework*

Electrochaea Corporation appreciates the opportunity to comment on the Massachusetts Clean Heat Standard (CHS) draft framework. Electrochaea believes that the fight against climate change must encompass all available technologies. Since the draft CHS excludes the use of renewable gases, it is eliminating one important means to reduce greenhouse gas (GHG) emissions. There is ample evidence from projects across the country to show that renewable gas technologies do significantly reduce GHG emissions specifically through reduced extraction and use of fossil fuels. We request that the Massachusetts CHS include renewable gases alongside the liquid biofuels and electrification schemes currently in the draft framework.

Electrochaea is the provider of a solution to increase the production of grid-quality renewable gases. Electrochaea's industrial-scale power-to-gas biomethanation technology produces renewable synthetic methane, a replacement for fossil natural gas across all current applications including building heating. Our process uses a biological catalyst, a methanogenic archaea, to combine $CO_2$ and hydrogen into synthetic methane. The resulting synthetic methane has a low carbon intensity (CI) similar to that of renewable natural gas (RNG).

When renewable gases, such as RNG and synthetic methane, are distributed in the existing natural gas system, that system becomes decarbonized. Using renewable gases prevents fossil fuel extraction and allows buildings to be heated with existing equipment, avoiding up-front capital costs for consumers while achieving GHG reductions. Enabling electrification in buildings is an important piece of the climate puzzle, and complementing it with other reduction strategies is a way to further drive emissions across different use cases. However, the exclusion of renewable gases in the MassDEP draft framework for a Clean Heat Standard eliminates a solution that is already being used to decrease GHG emissions from the use of natural gas across the USA. Electrochaea strongly encourages the MassDEP to include low CI renewable gases in the MassDEP Clean Heat Standard.

Sincerely,

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December 21, 2023
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Boston, MA 02114

**Energy Solutions Comments on:** MA Clean Heat Standard Draft Framework

Dear MassDEP,

The following comments are submitted on behalf of Energy Solutions. Energy Solutions is a mission-driven program implementation firm specializing in market transformation programs for clean energy technologies. For over 25 years, we have developed innovative, award-winning programs and pioneered market-driven solutions that deliver reliable, large-scale, and cost-effective savings to our government and utility clients across North America, including the Technology and Equipment for Clean Heating initiative ("TECH Clean California" or "TECH Initiative"), a statewide market transformation program driving adoption of heat pump space and water heating technologies.

We support the Massachusetts Department of Environmental Protection's (MassDEP) efforts in drafting the Framework for a Clean Heat Standard (CHS) that will lead to the deployment of electrification at scale and contribute to Massachusetts' greenhouse gas (GHG) emissions reduction mandates.

Our comments focus on four major areas: equity and customer targeting, post hoc modification of compliance obligations, centralized infrastructure needs, and consideration of heat pump water heaters as an eligible measure for clean heat credits.

## Equity and Customer Targeting

Energy Solutions supports the equity carve out in the Draft CHS Framework. As MassDEP continues to develop the Framework, we request that the following questions be considered:

**(1) To what extent does the CHS definition of "equity" align with utility, state, and federal goals?** The Framework defines equity solely by customers who are eligible for low-income discount electricity rates.[1] The MassDEP should consider how this definition of equity aligns with other equity definitions employed by utilities, state, and the federal government. It is highly likely that electrification projects that count towards CHS compliance will leverage incentives from other programs that define equity differently. MassDEP should coordinate with these other programs on defining equity, including how to potentially leverage or streamline customer targeting and verification mechanisms employed by these programs.

Several Massachusetts organizations define "equity communities" by geographic bounds that incorporate a variety of equity criteria. For example, the Massachusetts Executive Office of Energy and Environmental Affairs (EOEEA) has identified Environmental Justice Communities in the commonwealth[2] as census block groups meeting one or more of the

[1] DEP MA CHS Draft Framework Section 1, B, 2
[2] https://www.mass.gov/info-details/environmental-justice-populations-in-massachusetts

following criteria: *(1) the annual median household income is 65% or less of the statewide annual median household income, (2) minorities make up 40% or more of the population, (3) 25% or more of households identify as speaking English less than "very well", (4) minorities make up 25% or more of the population and the annual median household income of the municipality in which the neighborhood is located does not exceed 150% of the statewide annual median household income.*

Massachusetts energy efficiency program administrators leveraged this methodology in identifying underserved communities for targeted partnerships, increased investments, and increased benefits.[3] The Massachusetts Energy Efficiency and Advisory Council (EEAC) recently released an Equity Brief to inform the Mass Save 2025–2027 energy efficiency plan, which also identifies considerations and attributes of geographic areas that should be considered in defining equity communities.

Furthermore, the federal government's Justice40 requirements will be a component of the Inflation Reduction Act's (IRA) Home Energy Rebate programs. These programs will likely be leveraged for electrification projects that will contribute to regulated entity CHS compliance obligations. These IRA programs are required to utilize an income-based methodology for targeting incentives towards equity customers and are also subject to the Justice40 requirements that directs 40% of benefits of the program to occur within Disadvantaged Communities, defined as census tracts that meets specific threshold for *environmental, climate, and socio-economic burden*.[4]

Energy Solutions recommends MassDEP consider how maintaining or modifying the CHS's current definition of equity (customers eligible for low-income electric rates) would advance state and program goals for equity and emissions reductions.

**(2) How will the CHS mitigate potential bill impacts, particularly to equity customers?** Low-income and equity customers are sensitive to bill impacts, and heating electrification does not always result in customer savings in total across their energy bills. MassDEP should consider if it is appropriate to ensure that projects that count towards the equity carve-out provide any amount of protection for low-income and equity customers from potential increases in electric bills, or tenant protections for renters, and, if so, identify how these protections would be implemented. Additionally, as discussed in a subsequent comment, MassDEP should consider whether additional electrification measures such as installation of a heat pump water heater may be appropriate, especially for equity customers, as that technology is much more likely to result in monthly bill savings.

**(3) How can regulated entities and other stakeholders know when a project counts toward the equity credit?** Customer bill rates are Personal Identifiable Information (PII) that is confidential and protected. Stakeholders that are likely to be involved in the implementation of the CHS, such as fuel dealers, aggregators, heat pump installers, and

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[3] Applied Economics Clinic. (2021). Targeting Underserved Communities in Massachusett's 2022-2024 Energy Efficiency Plan

[4] https://www.energy.gov/justice/justice40-initiative#:~:text=Generally%2C%20a%20census%20tract%20that,will%20be%20marked%20as%20disadvantaged.

program implementors, do not currently have access to customer bill rate information. Without an income verification methodology to prove that a household is eligible to be counted towards the equity carve out, regulated heating energy suppliers and other involved stakeholders will have no way of managing to that goal. MassDEP should consider income verification methodologies that adequately address PII concerns. Expanding the definition of equity communities to include communities based around geographic areas would also provide a simpler pathway for stakeholders to manage to equity project compliance requirements.

One possibility MassDEP could consider is centralizing customer energy bill data, both gas and electric, in a protected state database. Such a database could be used to manage to equity goals, identify which customers might benefit the most from electrification, and facilitate targeted outreach to those populations. It could also facilitate verification of equity compliance requirements across multiple programs and could be initially developed to support the IRA's Home Energy Rebate programs.

A centralized customer energy bill database can be utilized to facilitate equitable outcomes for building electrification initiatives. For example, homes with relatively high cooling loads have a high potential for summer on-peak electricity bill savings when converting from older air conditioning equipment to newer, higher efficiency heat pump equipment. In our experience implementing [TECH Clean California,] we have shown that in California homes with the highest 25 percent of cooling burden, summer electricity bill savings are typically great enough to neutralize winter electricity bill increases resulting from fuel-switching.[5]

## Post Hoc Setting / Modification of Compliance Obligations Complicates the Policy

We recommend MassDEP consider how compliance obligations can be structured with long-term certainty for regulated entities. Setting or modifying a regulated entities' credit compliance obligations based on "actual" data creates a disconnect between what regulated entities plan for and the credit obligations that they must achieve. Instead, we recommend a framework for setting compliance obligations three years in advance and on a rolling basis, which would provide regulated entities with long-term planning goals to achieve their required electrification projects.

Post-hoc modifications of compliance obligations, such as weather normalization or verification that hybrid systems are only used for winter peaking during a given year, add complexity to the policy and could effectively shift the targets to which regulated entities had planned. The absence of long-term certainty around compliance obligations would likely drive a greater proportion of credits to be attained via the alternative compliance payment, which may be less cost-effective at achieving building electrification than programs that are run by the utilities.

## Centralized Infrastructure and Standardized Processes

MassDEP should further consider what statewide infrastructure is necessary to effectively implement this policy, and how to facilitate the creation of that infrastructure. The Draft Framework already identifies a need for a third party to develop and host an electronic Clean

[5] https://techcleanca.com/events/data-webinar/

Heat and Emissions Tracking System (CHETs) to provide for efficient program implementation. The following is a list of other functional infrastructure that could support the CHS:

- **Statewide Energy Usage Database / Customer Targeting.** In order to target customers that would receive the most beneficial bill impacts from electrification, the MassDEP should examine how to facilitate the creation of a statewide energy usage database that could be used to support building electrification initiatives. Unlike energy efficiency programs, building electrification programs create diverse outcomes that vary based on myriad details related to the site, the installed equipment, the marginal electricity and gas rates, and consumer behavior. To make electrification outcomes predictable for future programs and market participants, large datasets tying project details to long-term outcomes could be assembled and made available to the public (while protecting customer data privacy via protections such as the 15/15 rule employed in California and Illinois)[6]. Data could be used to appropriately quantify value streams resulting from electrification and appropriately compensate building owners for the value that they are creating, which could dramatically assist in the market transformation of clean heating technologies.
- **Credit Marketplace**. It is likely that the final structure of the Clean Heat Standard will result in a credit marketplace where credits can be bought and sold by regulated entities and/or aggregators. There are several existing clean energy marketplace models that have been established elsewhere, such as the low-carbon fuel standard, the RGGI credit trading market, and the forward capacity market for NE-ISO. We encourage MassDEP to consider a successful yet simple marketplace structure that avoids significant maintenance and transaction costs without consumer benefits.
- **Compliance Requirements.** MassDEP should consider how verification of program requirements (for example, the removal of fossil-fuel equipment for a "full electrification" project) will be enforced. For example, TECH Clean California requires that contractors submit a photo of the capped gas line to the Program Implementor in order to claim that the combustion space heating system had been fully decommissioned.
- **Statewide Incentive Clearinghouse.** The Massachusetts Department of Energy Resources (DOER) is scoping out the development of a Building Decarbonization Clearinghouse as a "one stop shop" that ideally will streamline applications to various program incentives in a centralized location.[7] We encourage MassDEP to work with DOER to determine how to incorporate any project data collection needs as well as verification requirements of the CHS program into that portal.
- **Statewide Alternative Compliance Payment (ACP) Program.** The Mass DEP should further elaborate on how ACP will be used to drive building electrification projects within the state. The MassDEP should consider how those funds for ACP should be distributed geographically, who would administer the program, and what infrastructure that program would require.

## Heat Pump Water Heaters should be included within the scope of the CHS

Lastly, Energy Solutions recommends that MassDEP expand the eligible measures under CHS to include water heating conversions from fossil fuel systems to highly efficient electric heat pump water heaters (HPWH). We appreciate MassDEP's efforts to not overly complicate the program; however, HPWHs provide significant benefits to homeowners including bill reductions in almost

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[6] https://www.elevatenp.org/wp-content/uploads/1515-Rule-Factsheet-FINAL.pdf

[7] Massachusetts Commission on Clean Heat Final Report - November 30 2022

all cases at a significantly lower upfront cost than heat pumps. While space heating is the primary source of building sector emissions, water heating is still a significant source of emissions. While HPWHs result in fewer emissions reductions, in aggregate, they are still significant. The Energy Pathways Report as part of the MA 2050 Decarbonization Roadmap assumes at least a third of all residential water heaters will be heat pumps by 2050 driven by a sharp increase in sales starting around 2025. The report also notes that the electrification of water heating has been found to be cost effective, citing a 2020 Brattle Group study that found HPWH to be the most cost-effective water heating decarbonization alternative.[8] We encourage MassDEP to consider HPWHs as an eligible measure under the CHS from the start of the program.

Energy Solutions appreciates the opportunity to comment on the exciting and innovative MassDEP Clean Heat Standard, and we look forward to continuing to work within the Commonwealth to advance decarbonize. Please do not hesitate to reach out with any questions.
Thank you,

Sincerely,

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[8] https://www.mass.gov/doc/energy-pathways-for-deep-decarbonization-report/download

Environmental Defense Fund

September 11, 2023

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Re: Massachusetts Clean Heat Standard Stakeholder Comment Request

Dear Commissioner Heiple,

Thank you for the opportunity to provide these comments regarding the March 2023 document entitled "MassDEP Stakeholder Discussion Document, Clean Heat Standard Program Design" and other on-going conversations regarding a proposed Clean Heat Standard (CHS) in Massachusetts. As appropriate, we may provide comments at another time regarding the document entitled "MassDEP Discussion Draft Regulation, Emissions Reporting Requirements for Heating Fuel Suppliers – for Stakeholder Comment Only."

Environmental Defense Fund (EDF) provides its comments in two parts. The first part addresses several overarching considerations such as the need for greater input from disadvantaged communities and the need for rigorous regulatory oversight of gas utility plans for meeting clean heat requirements. The second set focuses on the straw proposal regarding a CHS Program Design.

## I. <u>Overarching Considerations:</u>

*A. Need for Greater Input from Disadvantaged Communities*

First, we appreciate the efforts of the Massachusetts Department of Environmental Protection (DEP) in considering many of the comments received in May regarding the need to step back to review the structure and elements of a CHS. We are also appreciative of DEP's efforts to expand participant access by offering meetings at different times of the day and night. We note, however, that it appears that many of the attendees to these meetings have been companies providing energy services or environmental organizations; while we have not been able to attend every meeting, we are concerned that we have not seen participation by individuals or groups representing disadvantaged communities such as low- and moderate-income (LMI) residents and individuals or advocacy groups representing Black and Brown communities. A CHS can, and must, be designed to lessen energy burden and unintended harm to these communities. Thus, it is critical that connection to these community groups be made so that their input can inform the structure of a CHS. Based on the attendance thus far at CHS meetings, it appears that alternative outreach methods must be deployed to bring more diversity to the decision-making table. If EDF can be of help in assisting with this endeavor, please let us know.

*B. Need for Rigorous Regulatory Oversight of Gas System Planning*

A well-designed CHS should motivate energy providers to offer customers an array of clean heat measures that collectively meet the state's emissions reduction goals at the lowest cost. However, that objective will only be realized if there is careful oversight of the state's gas utilities to ensure that their investments in clean heat measures are consistent with truly least cost approaches, including consideration of the potential cost savings from reducing the size of their distribution systems. This is particularly important in the context of current gas utility plans to invest billions of dollars replacing aging pipes. As others have commented, DEP must work with the Department of Energy Resources (DOER) and the Department of Public Utilities (DPU) to foster accelerated progress on equitable gas restructuring and planned decommissioning of the bulk of the gas system. A CHS should result in reduced emissions by motivating the market to act differently, but it must also work in tandem with other policies and the regulatory process to ensure that a default outcome in 2030, 2040 and 2050 is not ongoing maintenance of a fully intact gas infrastructure to meet declining demand from an ever-shrinking number of customers randomly located throughout an expansive geographic area.

In addition, DEP should add a provision to the CHS that gas utilities must show where, how and over what time frame they plan to prune the underlying infrastructure. The proposed decommissioning should be presented as part of an overall, long-range plan to methodically and strategically stop investing in assets that will soon become stranded. Such plans should be regularly updated and made publicly available. DEP, in coordination with DOER and DPU, should be reviewing gas utility forecasts, infrastructure maps, and gas system enhancement plans (GSEP) to ensure that the market based CHS is accompanied with sensible, planned divestment in gas infrastructure.

*C. Need for On-Going Monitoring of Energy Burdens*

DEP, along with other policy makers and regulators, will need to monitor the potential impact of the CHS on LMI populations. While we offer some recommendations below for how to address the potential of increasing costs for LMI residents, additional actions will be needed. Examples include reassessing electric rate design for efficiently electrified homes and consideration of low-income rates for gas-heated homes. It may be beneficial to have a group of relevant policy makers and stakeholders regularly review (e.g., once a year) how the various energy policies are interacting to ensure that emission reductions are achieved and that this is accomplished without adding to the energy burdens of the LMI populations in Massachusetts.

*D. Need for Process Timeline*

Finally, we are hopeful that DEP will be able to provide a sense of the timeline and next steps for this process. At a previous meeting, it was mentioned that CHS implementation could roll out as early as the end of 2024. Charting out a clear timeline for this potential roll out would greatly assist in identifying the path forward.

## II. CHS Program Design Considerations:

DEP presents a series of questions under seven broad categories. We provide our comments via a similar structure, responding to the first six categories.

**Topic #1. Setting the Standard.**

*A. Sectors Covered by the CHS*

In the March 2023 document entitled "MassDEP Stakeholder Discussion Document, Clean Heat Standard Program Design", DEP proposes setting the size of the standard to align with the building sector emissions sub-limits established in the Clean Energy and Climate Plans for 2025 and 2030 (2025/2030 CECP).[1] Specifically, the DEP document references alignment with the building sector GHG emissions reductions presented in Table 5.2 below, from page 52 of the 2025/2030 CECP.

**Table 5.2. Emissions from Residential and Commercial Buildings**

| Buildings (Res. & Com.) Sector Emissions | 1990 | 2010 | 2015 | 2020 | 2025 | 2030 |
|---|---|---|---|---|---|---|
| **Residential** | 15.3 | 13.7 | 13.6 | 12.2 | 10.8 | 7.8 |
| **Commercial (without Industrial)** | 8.4 | 6.7 | 7.6 | 7.3 | 6.4 | 4.7 |
| **Total Gross Emissions ($MMTCO_2e$)** | 23.8 | 20.4 | 21.2 | 19.5 | 17.2 | 12.5 |
| **Total Percent Reduction from 1990** | | 14% | 11% | 18% | 28% | 47% |

*Note: GHG emissions in 2020 are based on preliminary estimates from MassDEP as of June 2022, while historical GHG emissions for years before 2020 are based on MassDEP's preliminary estimates in February 2022.*

While we agree that the standard should be expressed in terms of greenhouse gas (GHG) emissions and in alignment with other Massachusetts' policy guidance documents and analyses, the scope of the standard should not be limited to residential and commercial buildings. It should address industrial emissions as well.

The 2025/2030 CECP notes that space and water heating drive the majority of the energy demand in residential and commercial buildings, and that "industrial energy consumption differs significantly from residential and commercial building energy demands." We agree that there are important differences regarding both how fossil fuels are used and the potential measures for reducing their consumption in residential/commercial sectors vis-à-vis the industrial sector. However, those differences do not justify excluding the industrial sector from the CHS. Rather, there are a number of compelling reasons to include the industrial sector in the CHS, as provided below.

- **Industrial emissions also need to be reduced**. To meet the state's emission reduction targets, industrial emissions will also have to be reduced – if not through the CHS, then by some other policy instrument.
- **Industrial customers get the same fossil fuels from the same suppliers as residential and commercial customers**. The fossil fuels currently used in the industrial sector are

[1] https://www.mass.gov/info-details/massachusetts-clean-energy-and-climate-plan-for-2025-and-2030

largely the same as those used in residential and commercial buildings. And in most cases, they are being delivered to industrial customers by the same suppliers (e.g., gas utilities) that serve the residential and commercial sectors. Regulating industrial emissions through a different policy would require the unnecessary creation of different regulatory processes, likely adding further compliance burdens while potentially decreasing market efficiencies.

- **Many industrial emission reduction measures are the same as commercial measures**. Though some industrial end uses are very different, some (e.g., gas space heating boilers) are very similar to those used in the commercial sector for which an identical set of clean heat measures would be applicable. It makes no sense to treat identical commercial and industrial end uses and clean heat measures in different ways through different regulations. Doing so could potentially create market confusion.
- **There are important potential synergies in addressing industrial sector emissions under the same umbrella policy as residential and commercial emissions**. For example, we know that the availability of biofuels such as renewable natural gas (RNG) is very limited – and that their cost is quite high. Thus, it is important that emissions regulations encourage strategic consideration of the best applications for biofuels. There are strong arguments for prioritizing deployment of biofuels to support high heat industrial processes that cannot easily be electrified. However, if the CHS is targeted exclusively to the residential and commercial sectors, it will be harder for regulators to force gas utilities to strategically consider trade-offs in how RNG supplies are used. Put another way, a CHS that addresses only residential and commercial customers could create an incentive for gas utilities to maximize use of RNG to reduce residential and commercial sector emissions, even if/when it should be reserved – or at least prioritized – for industrial applications.

Rather than omitting the industrial sector from compliance with the CHS, DEP should ensure that the measures that will be needed to reduce emissions from this sector can receive appropriately determined credits. For example, on page 51 of the 2025/2030 CECP, it is stated that consumption of fossil liquids and gas in the industrial sector "tends to involve high-intensity processes related to manufacturing goods and products; relevant mitigation solutions focus on industrial hygiene and technical assistance, similar to policies implemented for the abatement of pollutants from non-combustion industrial processes." Designing the credits such that these types of activities are undertaken more frequently by market actors is how a CHS can drive market change across the entire spectrum of fossil liquids and gas consumption.

Thus, we recommend that the standard be set to include the emissions resulting from the "Residential Heating and Cooling," "Commercial & Industrial Heating and Cooling" and "Industrial Processes" sectors presented in Table 3.1, shown below (page 23 of the 2025/2030 CECP).

**Table 3.1. Economy-Wide GHG Emissions Limits and Sector-Specific Sublimits for 2025 and 2030**

| Sublimits | Gross Emissions ($MMTCO_2e$) | | | % Reduction (Increase) from 1990 | |
|---|---|---|---|---|---|
| | 1990 | 2025 | 2030 | 2025 | 2030 |
| **Residential Heating and Cooling** | 15.3 | 10.8 | 7.8 | 29% | 49% |
| **Commercial & Industrial Heating and Cooling** | 14.2 | 9.3 | 7.2 | 35% | 49% |
| **Transportation** | 30.2 | 24.9 | 19.8 | 18% | 34% |
| **Electric Power** | 28.0 | 13.2 | 8.4 | 53% | 70% |
| **Natural Gas Distribution & Service** | 2.3 | 0.4 | 0.4 | 82% | 82% |
| **Industrial Processes** | 0.7 | 3.6 | 2.5 | (449%) | (281%) |
| *All Others* | *3.4* | *1.0* | *0.9* | *70%* | *73%* |
| **Total** | **94.0** | **63.2** | **47.0** | **33%** | **50%** |

This would result in setting the CHS as presented in the table below. Note that it is not necessary to set sublimits for each sector. In fact, it may be more cost-effective to let obligated parties and the market determine the least cost path to achieving the clean heat standard. Regulators can set the CHS so that emissions from these three sectors are 23.7 by 2025 and 17.5 by 2030; then let the market respond.

| Sector | Gross Emissions (MMTCO2e) | | |
|---|---|---|---|
| | 1990 | 2025 | 2030 |
| Residential Heating & Cooling | 15.3 | 10.8 | 7.8 |
| Commercial & Industrial Heating & Cooling | 14.2 | 9.3 | 7.2 |
| Industrial Processes | 0.7 | 3.6 | 2.5 |
| Total | 30.2 | 23.7 | 17.5 |

### *B. Flexibility to Recalibrate Emission Reduction Requirements as Needed*

With regards to many of the other questions about how to set the standard, our overarching comment is that the CHS should be flexible to allow the market to determine the least costly methods to achieving the required emissions reductions. However, emission reduction requirements must be met, and important constraints and guardrails are necessary within the CHS design, to ensure that other environmental and social goals are addressed (discussed further below).

Quarterly reporting and an annual readjustment of required emissions reductions based on the previous years' performance will be necessary for regulators to provide directional guidance to gas local distribution companies (LDCs) as well as fuel delivery providers, and to ensure that the state's emission reduction goals are actually achieved.[2]

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[2] To this point, the DEP should review the deployment of CHS in other jurisdictions to identify unexpected challenges in meeting emission reduction goals and ensure the Massachusetts CHS does not have a repeat experience.

*C. Allocation of Emission Reduction Requirements*

Regarding setting an annual percentage amount for each company, an initial approach could be to require emission reductions that reflect each obligated party's percentage share of emissions. For example, if emissions from a particular gas LDC's 2023 fossil fuel sales to residential, commercial and industrial customers was equal to 10% of the state's total 2023 emissions from those customers, then that LDC would be required to meet at least 10% of the statewide emission reductions required for 2025.[3]

*D. Emissions Reduction Trajectory*

It may make sense to allow for "ramping up" of the requirements. For example, the first year could require a slightly lower percentage requirement than a linear path to the 2030 emission reduction targets would suggest, with the increase in credits in subsequent years growing at a pace necessary to reach the 2030 target (as well as any subsequent policy milestones). The rationale behind this approach is that the first year of a program often involves some learnings – engaging market change typically takes more effort at the beginning of a program offering as compared to after the program has been up and running for some time.

*E. Electrification "Carve-Outs"*

The EDF supports a managed, phased transition away from fossil liquids/gas and towards an efficient electrified future. However, we recognize there may be a role for biofuels and renewable gas in decarbonizing specific, hard-to-electrify industrial processes. We also appreciate that the magnitude of emission reductions necessary to meet the state's near-term goals (e.g., 2030) may require deployment of a broad array of measures.

However, the design of the CHS must ensure that gas LDCs do not promote use of RNG as a pretext for continued investment in long-lived infrastructure (e.g., the gas distribution system) that will quickly become under-utilized; similarly, the CHS design must ensure that delivered fuel providers do not simply plan to deliver biodiesel. There is copious literature stating that there is not enough RNG to meet current demand.[4] Thus, the CHS must be designed such that the focus of activities and measures is on weatherization, other types of efficiency investments, and electrification.

Indeed, the Clean Heat Commission (CHC) stated that: "To support the decarbonization of the Commonwealth's building stock, the CHS' long-term objective must be to promote electrification of the thermal sector, in alignment with the 2050 Roadmap findings and

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[3] There may need to be a time lag between the reference year for allocating emission reductions (2023 in this example) and the year in which emissions need to be reduced (2025 in this example), as a final documentation of fossil fuel sales and emissions in a given year may not be available until well into the following year and obligated parties will want to know their annual emission reduction obligation in advance of the beginning of each the year so that they can plan ahead.

[4] For example, the American Gas Foundation commissioned a study that found that RNG had the potential to meet between 4% - 10% of natural gas usage consumed in the United States in 2010. American Gas Foundation September 2021. The Potential for Renewable Gas: Biogas Derived from Biomass Feedstocks and Upgraded to Pipeline Quality. Developed by Gas Technology Institute. P. 3.

2025/2030 CECP policies, and in conjunction with significant thermal load reduction."[5] To largely electrify building energy use is going to take time – probably decades – because of both the long-lived nature of heating equipment (gas furnaces typically get replaced only every 15-20 years) and because of the need to grow the market for efficient electric alternatives (e.g., heat pump technologies[6]). In this context, EDF supports a CHS that requires a significant portion of CHS credits, even in early years (to spur growth in heat pump and other markets for electric technology), come from electrification measures.

*F. Guardrails for Biofuels*

It is important to recognize that not all biofuels nor renewable gases are equal. Indeed, some biofuels can provide very little in the way of GHG reductions when their full lifecycle impacts are considered. Also, some can create other environmental and social harms even if they do provide GHG emission reductions. Thus, there must be guardrails put in place in the event that DEP determines these energy sources are to receive credits. Potential guardrails could include:[7]

1. Requiring a lifecycle accounting of GHG emissions from any renewable gas/biofuel that receives a credit;[8]
2. Establishing maximum lifecycle carbon intensity scores (or minimum levels of GHG emissions reductions relative to fossil fuels displaced) for biofuels and RNG so that only those which produce substantial emission reductions may be credited as clean heat measures (these standards could also become more stringent over time);
3. Requiring a contractual pathway for delivery of RNG, just as would be necessary for fossil gas (i.e., obligated parties must do more than just acquire the environmental attributes for fuels);
4. Limiting eligibility for CHS credits for RNG to sources of methane that would have existed absent the Massachusetts CHS and/or similar policies in other jurisdictions – i.e., new sources of biomethane whose emergence can be tied in whole or in part to markets for RNG could not be credited;[9]

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[5] Massachusetts Commission on Clean Heat – Final Report. November 30, 2022. P. 19. https://www.mass.gov/info-details/commission-on-clean-heat-issues-final-report

[6] Note that by "heat pump technologies", we are referring to the broad swath of options, including heat pump water heaters, ground source heat pumps, and cold climate air source heat pumps. We specify the use of "cold climate" air source heat pumps due to Massachusetts' climate. Finally, it is important that the heat pump industry is evolving rapidly – other applications and modifications are likely to continue to evolve, and ongoing review of this technology evolution should be part of CHS implementation.

[7] All of these, other than a cap on the portion of emission reductions that can come from RNG and/or biofuels, were included in the Clean Heat Standard enacted in Vermont (the Affordable Heat Act) earlier this year.

[8] The lifecycle accounting should reflect, to the extent practical, best estimates (counting for local circumstances) of actual emissions impacts and only use default assumptions when absolutely necessary. Note, for example, EDF's findings that U.S. onshore gas pipeline methane leakage is between 3.75-8 times greater than estimated by the EPA. https://www.edf.org/sites/default/files/documents/Pipeline%20Methane%20Leaks%20Report.pdf

[9] RNG emits the same amount of GHG when burned as fossil methane. Thus, it can produce emission reductions only if its capture and combustion eliminates atmospheric emissions of methane (a potent GHG) that otherwise would have occurred. In other words, RNG can reduce emissions only to the extent that its burner-tip emissions are offset by reductions of other emissions that would have otherwise occurred. If a new source of RNG is created

5. Providing guidance that eligibility of renewable gas/biofuels for CHS credits be precluded for any fuels that are shown to create other environmental and/or social harms – e.g., deforestation or forest degradation, conversion of grasslands, increased emission of criteria pollutants, damage to watersheds, etc.; and,
6. Capping the percentage of credits that can come from renewable gas/biofuels. This cap could change over time.

*G. Early Reduction Credits*

Regarding whether the standard should accommodate clean heat that is deployed before the program takes effect – the real question here is whether the required emissions reductions are achieved. If the requirement is to have the residential, commercial and industrial heating and cooling sectors only emit 17.5 MMTCO2e in 2030, then that should be what matters. Activity that begins prior to the CHS being implemented can make the end target more achievable. Thus, if the number of CHS credits that obligated parties are required to produce is based on a calculation of emission reductions required from 2023 (or an earlier reference year), it would be appropriate to provide CHS credits to any measures installed after 2023 (or any earlier reference year use to set CHS credit obligations).

*H. Low and Moderate Income (LMI) "Carve-Out"*

A carve out for LMI residents is critically important. Decades of program implementation in energy efficiency have shown that reaching this demographic requires more effort, time and money. As a result, if the Massachusetts CHS left it entirely to the market to determine which investments are made to reduce emissions, it is likely that very few investments would be made in LMI homes – leaving LMI households with much less than their proportional share any of the potential benefits of decarbonization (e.g., reduced energy bills from electrification and/or weatherization) and with a disproportionate share of the cost of paying off gas utility infrastructure investments. A LMI carve-out – minimum requirements for the portion of major CHS measure investments like heat pumps and weatherization be made in LMI homes – is necessary to ensure that a CHS is equitable.

We point to Justice40[10] as a guide for setting the carve out whereby at least 40% of long-lived CHS measures must be installed in LMI communities. Regarding how to define LMI, we again suggest utilizing existing Federal guidance to develop Massachusetts' policy framework. One example which Massachusetts regulators could consider is the approach taken by the Federal government's Solar for All grant (which complies with Justice 40), whereby LMI can be defined via four approaches (the Climate and Economic Justice Screening Tool, the EJScreen tool, an income-based approach and another approach defined by properties providing affordable

because of market demand driven by CHS and/or related policies, burning of that RNG does not provide any offsetting emission reductions because, by definition, they would not have been occurring absent climate policy.

[10] https://www.whitehouse.gov/environmentaljustice/justice40/

housing).[11] We suggest this approach because the more consistency there is across different programs and regulations, the more efficient (hopefully) and less confusing programs may be.

*I. Simultaneous Roll out of "Cap-and-Invest" Policy*

We suggest that the discussion of simultaneously rolling out a "cap-and-invest" program be set aside, for now. CHS and cap-in-invest policies are far-reaching and complex policies to design and administer. Thus, we believe it is better to, at least initially, focus on one. Let's get the CHS "right", then assess CHS performance after a few years and determine next steps at that time. New York State is working on the design and implementation of an economy-wide cap-and-invest program, with a goal for a first auction to occur in 2025. If it is determined that an additional policy is needed, Massachusetts could consider any number of actions, including assessing whether or not to join New York's initiative.

**Topic #2. Regulated Heating Energy Suppliers**

With regards to which companies should be obligated to comply with the CHS, we recommend that all entities that sell fossil liquids/gas to end-use customers be included in the obligation. We do not recommend including electric utilities, as they are already complying with other regulatory programs to reduce emissions, namely Massachusetts' Renewable Energy Portfolio Standard (with other complimentary mandates such as the Clean Peak Energy Standard). Moreover, if additional costs are imposed on the electric sector – rather than the fossil fuel sector that is actually responsible for building and industrial emissions – it will make the customer economics of electrification more challenging at exactly the time that we need customers to invest in heat pumps and other electric measures.

Compliance for smaller fuel providers can be made easier through the development of a "default delivery agent" (DDA). An example of a DDA is MassSave, as well as other Program Administrators implementing various energy programs to end users. The CHS could be designed so that fuel delivery companies are automatically reporting to the DDA and must actively opt-out of the DDA if they want to actively manage their own compliance and credit processing. This opt-out approach makes it as easy as possible for fuel delivery providers to comply with the CHS, while also providing them an opportunity to comply directly if they so choose. The process to comply directly (or to opt-out of the DDA) should be made as simple as possible. The purpose of the opt-out approach is to make it easy for smaller businesses to comply; the purpose is not to obstruct them from choosing to engage more closely with the CHS. However, DEP may wish to discuss this opt-out approach with future obligated parties, as they may have a different perspective. An option to "opt-in" to a DDA could provide similar benefits.

In keeping with the above recommendations, municipal gas utilities should be obligated parties and municipal electric utilities should not. Similar to the recommendation for smaller delivery companies, municipal gas utilities should also be able to comply via the DDA.

[11] EPA-R-HQ-SFA-23-01 Revised 2023 08 31. Pp. 10 – 12. Downloaded on September 8, 2023 from: https://www.grants.gov/web/grants/view-opportunity.html?oppId=348957

**Topic #3. Credit Generation**

*A. Eligibility/Ineligibility of Different Measures*

Given that the CHC report stated that the CHS should drive towards long-term electrification of the thermal sector including reductions in thermal load, credits should be applied to clean heating technologies such as heat pumps designed for cold climates, networked geothermal systems, weatherization, heat pump water heaters, induction stoves, clothes dryers and the like. To ensure that the list of creditable technologies reflects the current understanding of clean technologies, there should be regular review of the technology list to add and drop technologies in a timely manner. This process should be as transparent as possible and should leverage previous technology analyses and processes already undertaken in Massachusetts, such as that undertaken to regularly update the Massachusetts Technical Reference Manual for Estimating Savings from Energy Efficiency Measures.[12]

As mentioned earlier, in the event that renewable gas/biofuels are made creditable actions, the structure for these actions must be supported by robust guardrails (see above for details). While green hydrogen can be an important substitute for fossil gas for high-heat industrial applications, there should be no role for crediting use of hydrogen blended with methane for delivery through gas utility distribution systems. The potential emission reduction benefits are just not substantial enough to warrant a focus on this measure.[13]

Under no circumstance should credits be allowed for switching from one fossil fuel (e.g., oil) to another (e.g., gas) – even if there is an emissions reduction. First, the purpose of a CHS (and other similar energy policies) is to instigate market change. It is currently an economically rational choice for a customer to shift from oil or propane to gas – there is no reason for state policy to provide further support for this activity. A similar rationale underpins our recommendation that there should be no credits provided for purchasing a new fossil-based heating system (furnace, boiler); this is the status quo for market activity and does not need further support. Second, if the long-term goal is to shift heating and cooling consumption away from fossil liquids and gas, then offering credits for the above activities runs counter to that goal. The majority of heating equipment lasts for 15-20 years; locking in customers to fossil-based technologies that will see diminishing market share (and therefore, typically, diminishing customer support and replacement parts) not only makes achieving Massachusetts' emissions reductions requirements more challenging, but it also does a disservice to the end user.

There should be no credits provided for "certified gas" or "responsibly sourced gas". Achieving Massachusetts' required emissions reductions necessitates massive reductions in gas consumption alongside massive investments in efficiency and (renewably-sourced) electrification. Providing credits for "certified" or "responsibly sourced" gas would distract focus

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[12] https://etrm.anbetrack.com/#/workarea/home?token=6d6c45766e692f527044

[13] At most, ~6% hydrogen blending by energy content (equivalent to ~20% by volume, given hydrogen is much less dense than methane) – and possibly only half that amount or less – is possible with existing pipes and appliances. Given that all independent studies suggest methane gas consumption will need to decline by 75-90%+ over time, hydrogen blending can at best be on the order of 1% of the ultimate solution to building emissions.

from, and likely delay investments in, decarbonization, which is one of the primary paths defining Massachusetts' energy policy.

With respect to the question of whether a "threshold percentage standard of improvement" should be required for a measure to be eligible for clean heat credits, our view is that there should be such a standard - based on lifecycle emissions - for RNG/biofuels (as discussed above), but not for weatherization/efficient or for electrification measures.

There are a few reasons for a different approach to RNG/biofuels than for other measures. First, weatherization projects tend to produce only 15%-25% savings. We believe it is important to promote weatherization projects, both for near-term emission reductions and for long-term economic efficiency and their ability to reduce low-income energy burdens while improving comfort. Second, we expect the electric grid to become zero GHG-emitting (or very close) in the medium to long-term. In this case, there will be no significant difference in emissions between switching from fossil fuels to efficient electric measures (e.g., a heat pump water heater) and switching inefficient electric measures (e.g., an electric resistance water heater) – even if there is a difference in the near-term.[14] Third, some buildings cannot accommodate efficient electrification measures because of the way they are designed. For example, a heat pump water heater cannot generally be installed in the water heater compartment of a mobile home. Precluding installation of an electric resistance water heater in such a home because it doesn't produce quite enough emissions reduction in the near term – even if it would in the long term as the grid becomes zero-emitting – would be highly problematic. Fourth, it may be important to customers to combine some electrification measures that may provide only modest GHG emission reduction benefits (e.g., electric stoves replacing gas stoves) with others that provide more substantial benefits (e.g., cold climate heat pumps replacing gas furnaces) – in order to get completely off fixed monthly gas bill charges.

Thus, rather than incorporate threshold standards of improvement for electric measures within the CHS, the state should use its electric utility efficiency programs to promote the most efficient installations possible.

### B. *Determination of Clean Heat Credit Values*

Regarding the value of credits each eligible clean heat measure should receive, we suggest a process that is very similar to how energy efficiency savings are currently estimated and counted towards the state's utilities' energy efficiency savings goals. For common measures, such as cold climate heat pumps, there can be a deemed average CHS credit value – or a deemed average per unit of heating capacity, much like the state's Energy Efficiency Technical Reference Manual establishes deemed savings values for common measures promoted through mass market channels. Those values should be periodically evaluated through field studies and updated – just as deemed efficiency savings values are. In fact, deemed GHG emission reductions should be based on many of the same assumptions used to derive deemed energy savings values. For more

[14] This issue can also be addressed by treating electrification as zero-emitting.

complex, less common and less uniform measures – including different sources of biofuels and complex industrial process changes – custom, measure-specific estimates of clean heat values should be developed. Again, this is analogous to how energy savings from complex measures (particularly for large commercial and industrial customers) are developed today.

We believe it would be easiest to understand if credits are denominated in units of CO2e emission reductions. There is nothing inherently wrong with a different form of denomination, such as a "yardstick" of the average emissions from a single-family home – as long as the approach to determining how much of such a yardstick each measure earns is reasonably accurate on average (per the methodology suggested in the paragraph above). However, such yardsticks could become confusing over time as the average emissions profiles of homes (or other measuring sticks) evolve.

*C. Verification of Emission Reductions*

Third party verification will be an important aspect of this program to ensure accountability and accuracy of program reporting. Verification can be deployed in a similar fashion as to what is currently executed for MassSave programs.

**Topic #4. Compliance Flexibility and Revenue**

*A. Alternative Compliance Payment (ACP)*

The reason for establishing a policy such as a CHS is to motivate energy providers (and end users) to make changes in their energy purchases so that the state's mandated emissions reductions are achieved. Because it is a market-based policy, the CHS inherently provides flexibility to obligated parties to find lower cost solutions – within the guardrails and constraints established by the CHS. And as discussed above, the CHS can be enhanced by creating a default delivery agent to which obligated parties can assign their obligation (provided they also provide the funds necessary to meet it). The CHS also provides market actors, such as heat pump installers and weatherization providers, a way to enhance their existing business model by enabling them to generate and sell CHS credits to obligated parties.[15] In short, we believe that the CHS already provides significant flexibility. Establishing an Alternative Compliance Payment (ACP) may provide additional flexibility, but at a cost. In particular, it could lead to the Commonwealth not meeting its emission reduction goals.[16] Thus, we are not supportive of the initial CHS design incorporating an ACP.

*B. Banking of CHS Credits*

We recommend that obligated parties be allowed to bank a limited number of credits for use in the future when they over-comply with emission reduction requirements in a given year. For example, the CHS may allow credits to be banked for 2 or 3 years and allow an obligated party

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[15] Such contractors would presumably need to get their customers to sign over the rights to the credits to them, probably in exchange for a reduction in project costs.

[16] If there is an option to assign an obligation to a default delivery agent, the only reason an obligated party would use an ACP is to spend less money than would be necessary to achieve the emission reductions assigned to it.

to draw on banked credits to meet up to a modest percentage (e.g., 15-30%) of its obligation in any given year.

The rationale for allowing some banking is to provide some implementation flexibility. For example, there will likely be a situation in which a smaller energy provider has an opportunity to complete a large clean heat project for a customer; it makes more sense to have both entities complete the project as one, holistic construction process and to allow excess credits to roll forward than to require both entities to go through the complexity to complete part of the project in one year and the remainder of the project in a subsequent year. It is important to emphasize that cumulative emission reduction goals must still be met if banking is allowed. That said, there should be some limitations on the use of banked credits so that obligated parties are sending consistent signals to the market, year-over-year, in support of growing demand for important clean heat measures such as cold climate heat pumps.[17]

The goal for the CHS is to provide clear signals to the market so that the required emissions reductions are achieved by the required date. This should be the guiding principle when determining program design. Thus, the CHS should not allow for any "borrowing" of future emission reductions or CHS credits. Borrowing defers meeting the required emissions reductions and creates market uncertainty.

*C. Penalties for Non-Compliance*

We note that DEP did not ask about penalties for parties that do not develop enough clean heat credits to meet an annual obligation. We recommend that DEP include a penalty for noncompliance in the CHS. Further, the penalty needs to be large enough that it is significantly more expensive than program compliance. Finally, there must be a program mechanism or audit process to ensure that regulated gas utilities do not simply pass penalty costs on to the end user/customer – penalty costs should be borne by shareholders. We specify regulated gas utilities because their customers do not have the option of switching to another provider. The passing on of penalty costs is less of a concern for fuel oil and propane dealers because they function in a competitive market that allows customers to switch from one provider to another if costs charged to them become higher than average.[18]

**Topic #5. Reporting Requirements for Heating Energy Suppliers**

[17] If would be very disruptive for clean energy businesses if an obligated party was allowed to use banked credits to meet 100% of its obligation in a given year, and as a result stopped offering incentives for weatherization and heat pumps for a year, only to ramp them back up again a year later.
[18] Additionally, regulators can monitor and assess the flow of penalty costs for regulated entities, but not for fuel delivery companies.

DEP should require quarterly reporting from energy providers and an annual review of CHS progress by regulators. Depending on results during the annual review, regulators may need to reset/modify program design elements including interim emissions reductions targets.

With regards to the question “Should any exceptions or special requirements be included, such as for cooking fuel or for synthetic fuels such as ‘renewable diesel’?”, there should be no exceptions. If DEP determines that renewable gas and bioliquids are eligible for credits, then the credits should be based on the difference between the emissions resulting from combustion of the liquid/gas used prior to the measure/activity being undertaken, and the emissions resulting from the subsequent use of the renewable gas/bioliquid. As mentioned earlier, the design of the credit should be based on the lifetime emissions of the gas/liquid (extraction, production, transmission and distribution including leakage, leakage within the end user’s building and burner tip).

We recommend requiring the obligated party for delivered fuels be the entity that provides the fuel to the end user. In the event that DEP allows credits for renewable gas and bioliquids, DEP could update existing fuel recording templates to incorporate alternative gases and fuels, and provide those to obligated parties. This would assist smaller fuel providers who opt-out of the DDA in that they could fill out a pre-designed form once a quarter. To tally installed measures, DEP could choose to build off the state TRM as well as previously existing reporting structures utilized by MassSave and other program administrators. This approach would offer obligated parties a form to complete on an ongoing basis for quarterly submission.

**Interactions with Other Programs**

*A. “Double-Dipping”*

We find the term “double dipping” to be unclear. Is DEP asking about obligated parties? End users?

If DEP is asking about obligated parties – they should not be able to “double count” clean heat credits. Specifically, two different obligated parties should not be allowed to claim clean heat credits for installation or sale of the same clean heat measure (in the same home or business). As discussed above, an annual auditing and evaluation process will need to be put in place to verify whether obligated parties have accurately accounted for clean heat credits that they have earned. That process should not only look for accounting mistakes and fraud, but also for cases in which more than one obligated party may be claiming credit for the same measure.

DEP may also have been asking about something very different: can a measure installed to address another state policy requirement also provide clean heat credits that count towards an obligated party’s annual CHS requirements. For example, could a heat pump installed through the state’s utilities’ current energy efficiency programs also earn credits that count towards CHS obligations. From our perspective, the answer depends on how CHS annual goals or clean heat credit requirements are established. If annual CHS goals are based on the *total emissions reduction required to achieve 2030 and subsequent targets*, then measures installed pursuant to other policies should also be allowed to count as CHS measures. Alternatively, if the number of CHS credits to be required each year was equal to what was necessary to meet 2030 and subsequent goals *after subtracting emission reductions expected by 2030 (and subsequent years) from other policies*, then measures installed pursuant to other policies should not be allowed to count as CHS measures. This distinction may be made clearer by the following hypothetical:

- Emissions in 2024 are 200 units of GHGs
- Emissions must be reduced to 100 units of GHGs by 2030
- State policy requiring utilities to run energy efficiency programs are expected to reduce emissions by 2 units of GHGs per year from 2025 through 2030 – or 12 units total by 2030.

Under this hypothetical, if obligated parties were required to generate 100 post-2024 clean heat credits by 2030, they should be allowed to count the 12 credits generated by utility efficiency programs. If they were not allowed to credit emission reductions from those programs, the state would only have 88 units of GHG emissions in 2030 or over-comply by 12 credits. Alternatively, if the CHS obligated parties were required to produce only 88 emission reduction credits by 2030, because the state was counting on an additional 12 credits from efficiency programs to be produced, then the obligated parties should not be allowed to credit efficiency program emission reductions.

Our view is that it would be simplest to set CHS emission reduction obligations at the level of total emissions required to meet 2030 and subsequent goals and allow all measures that reduce emission – including those installed pursuant to other state policies – to be eligible to earn credits. There are a couple of reasons for this recommendation. First, it eliminates the need to estimate how much emission reduction those other state policies will produce in establishing CHS requirements. It is always challenging to accurately forecast impacts of existing policies. It would be next to impossible to forecast impacts of any new policies that could also emerge. Second, if CHS goals are based on total emission reductions needed so that all measures count, there would be one market for clean heat measures – perhaps multiple funding streams supporting the market, but one market. The alternative would be market confusion with different parties offering different incentives for different purposes to try to convince the same customers to install the same measures.

DEP may also be asking about how incentives are used by end users. Given the size of the emissions reductions required, and therefore the magnitude of activity and investment that will be asked of customers, we see no issues with allowing customers to leverage multiple incentives to ensure completion of projects.

*B. Credit Ownership*

Regarding initial credit ownership, for most projects it is the end user who is making the clean heat investment and therefore they, as owner/creator of the credit, should be aware of the credit and be onboard with assigning it (and its value) to another entity, be it a gas LDC, fuel deliverer, weatherization contractor or DDA. There are multiple approaches to addressing this transfer of credit ownership.

As a start, the CHS should be flexibly designed such that customers can sign over the credit rights to the contractor, so they may sell them to whatever obligated party they want. Another example of transferring credits can be found in the Forward Capacity Market, whereby Program Administrators frequently add language on rebate forms stating that, if a customer takes the rebate, then the Program Administrator owns the associated credits. Meanwhile, the Solar Massachusetts Renewable Target Program (SMART), as discussed by Synapse in their May 8, 2023 memo, provides an example of how a customer could transfer a credit to a gas LDC:

> "In the SMART program, the generation attributes (RECs) are retained by the interconnecting electric delivery company (EDC)…Solar installers are required to submit SMART program applications on behalf of customers, and system owners sign a REC assignment form acknowledging the EDCs ownership of the RECs before enrolling in the tariff. EDCs either retain the RECs for use towards their own Class I RPS compliance or resell excess RECs into the RPS market. The automatic transfer of RECs to EDCs means that customers are fully insulated from the REC market, but this automatic transfer, especially when paired with the requirement that installers enroll system owners in the SMART program, ensures that eligible systems are enrolled in the applicable incentive program."

The above examples show a variety of approaches to ensuring the end user understands the value of the credit and is actively aware of any potential transfer of that value, while also minimizing the degree to which an individual homeowner would need to become knowledgeable with the CHS credit market. Finally, we do recommend that customers be allowed to keep their CHS credits, if they so choose (this could, however, result in a slightly higher installation charge by a weatherization contractor, or less of a rebate from a DDA or gas LDC). Ultimately, the intent of the above suggestions is to insulate the customer while ensuring they are aware of the credit value and that they receive some benefit from it (e.g., via a reduction in installation costs). Most customers, particularly owners of single-family homes, are unlikely to want to engage in the CHS credit market; the above approaches seek a middle path.

Thank you for considering EDF's comments. We look forward to participating in future discussions.

Respectfully submitted,
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December 21, 2023

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Re: Massachusetts Clean Heat Standard Stakeholder Comment Request

Dear Commissioner Heiple,

Thank you for the opportunity to provide these comments regarding the November 2023 MassDEP Clean Heat Standard (CHS) Draft Framework, presented via multiple documents (Draft Framework; Frequently Asked Questions; Voluntary CHS Early Registration Program; Technical Session: Draft Framework Review December 7, 2023 presentation; and the CHS compliance obligation calculator).

We understand MassDEP's focus to implement a program that is relatively simple and clear in a swift timeframe. We appreciate MassDEP's creativity with presenting a proposal that is, effectively, two standards. This approach will assist in ensuring that clean heat equipment is directly installed in willing end users' properties – thereby electrifying Massachusetts' housing stock - while also maintaining a focus on emissions reductions. We support the opportunity for early action credits, given the scope and scale of the near term 2030 emission reduction deadline. We find the Just Transitions fee to be innovative and critical. We also appreciate the proposal to transition both the residential electrification and emission reduction obligations from fossil fuel companies to electric utilities over time. Finally, we support the proposed program review in 2028 and periodically thereafter.

That said, we pose some and raise concerns about several aspects of the proposed clean heat policy and would like to offer some suggestions for refining it, as discussed below.

## Expand the Range of Creditable Actions

We read the proposal to allow only space heating electrification and certain liquid biofuels to be eligible to earn clean heat emission reduction credits. Energy efficiency improvements are specifically excluded. We have several concerns about these limitations.

First, it appears as if MassDEP has established emission reduction obligations at levels that are based on total building sector emissions (currently 24 million MT) such that those emissions would be completely eliminated by 2050. While space heating is the largest source of building sector emissions, it is not the only source. Thus, it will not be possible to meet MassDEP's specified emission reduction targets without crediting measures that reduce emissions associated with water heating, cooking, drying and other end uses.

We are particularly concerned that gas utilities will be very challenged to meet emission reduction goals. For example, as shown below in Table 3 of the Framework document (copied below), by 2030, a fuel seller with 10,000 customers would need to ensure that heat pumps were installed in 380 residential units. Each housing unit with fully electrified space heating would be credited with 5 MT of emissions reductions every year, resulting in a total of 3,925 MTs of cumulative annual emissions reductions by 2030.[1] Thus, the residential electrification obligation will only account for 31% of the 12,500 MT of the emission reductions the seller would be obligated to produce. With emission reductions from weatherization, other forms of residential electrification (e.g., water heaters), and gaseous biofuels not being creditable, the remaining 69% (and even higher percentages in earlier years) of gas utility emission reduction obligations could only be met with electrifying of commercial space heating (and/or over-complying with residential electrification obligations). We are concerned that may not be feasible or realistic. While the gas utilities could instead meet their emission reduction obligation through the ACP, we suggest that would be less than ideal because emission reductions would not actually be achieved at levels and in a timeframe consistent with state goals.

Table 3. Requirements for an example fuel seller with 10,000 customers, assuming 5 MT annual emissions per customer.

| | 2026 | 2027 | 2028 | 2029 | 2030 | 2035 | 2040 | 2045 |
|---|---|---|---|---|---|---|---|---|
| Full electrification standard (number) | 8 | 39 | 73 | 110 | 150 | 100 | 0 | 0 |
| Low income carve out (number) | 2 | 10 | 18 | 27 | 38 | 25 | 0 | 0 |
| Emission reduction standard (MT) | 2083 | 4348 | 6818 | 9524 | 12500 | 8333 | 0 | 0 |
| (As a percent of estimated emissions) | 4% | 9% | 14% | 19% | 25% | 17% | | |

Thus, at a minimum, we recommend that the list of clean heat measures eligible for earn emission reduction credits be expanded as follows:

- **Weatherization should be eligible to earn emission reduction credits (e.g., 0.5 MT per whole home weatherization job)**. A comprehensive whole home weatherization job can typically achieve approximately a 20% reduction in heating loads. If a full residential space heating electrification job is to earn 5 MT of emission reductions, weatherization of an unelectrified home could earn 1 MT. That said, we appreciate that there are interactive effects between weatherization and electrification, as well as between weatherization and biofuels. Since all homes will eventually need to electrify (or convert to 100% biofuels) by 2050, perhaps weatherization should only receive 0.5 MT of emission reduction credits as a simplified way to adjust for such interactions.[2] The policy could even state that this allowance would only apply through 2035 or would be subject to adjustment in the future. Note that crediting weatherization will also create additional incentive for obligated parties to promote it, which can be very important because space heating electrification may be more acceptable to consumers – both from an energy bill standpoint and a comfort standpoint – if the thermal envelop of the building is efficient.
- **Residential water heating should be credited with 2.0 MT of emission reduction credits**. The average residential fossil fuel water heater consumes approximately 40% as much gas or

[1] Based on MassDEP's description of the proposed policy, we assume that a fully electrified space heating system for a residential housing unit would be credited with 5 MT of emission reductions in the year it was installed as well as in each subsequent year through 2050.

[2] We note, also, that if weatherization is included in the CHS as an eligible measure, then the weatherization activities would need to be defined to ensure that the credited value is reasonable. This could include, for example, requirements for blower-door guided air sealing and installations by certified contractors.

oil or propane as is typically used for space heating.[3] Water heating electrification can also often be even more cost-effective than space heating electrification. Therefore, water heating electrification should be credited with 40% of the space heating credits, 2.0MT.

- **Other electrification measures should be creditable**. This might include residential clothes drying, residential cooking and a range of commercial fossil fuel uses. These measures can also have deemed credit values that could be established relative to average consumption patterns by end use in Massachusetts.

## Differentiate between Single Family and Multi-Family in the Number of Emission Reduction Credits

While we understand MassDEP's emphasis on simplicity as the rationale to provide the same emission reduction credit value to all residential housing units, we suggest that the average emission reduction achieved will be significantly different for single-family homes than for multi-family apartments. Consider, for example, the following table showing average space heating consumption in northeastern homes by fuel and building type.[4] This suggests that multi-family housing units should – at most – be credited with only half as much emission reduction per full electrification project as single-family homes. However, we want to emphasize that it is important that obligated parties have incentives to electrify both single-family and multi-family buildings.

**Table 1: Average MMBtu Space Heating Energy Consumption by Building Type and Fuel in Northeast**

| Building Type | Gas | Propane | Fuel Oil |
|---|---|---|---|
| Single Family Detached | 72.7 | 41.7 | 72.6 |
| Single Family Attached | 47.9 | 31.6 | 48.9 |
| Apartments in Buildings with 2-4 Units | 39.5 | n.a. | 27.6 |
| Apartments in Buildings with 5+ Units | 15.6 | 8.2 | 14.8 |
| Mobile Homes | 51.4 | 41.6 | 44.1 |

## Broaden the Scope of the Obligation to Include Industrial Sector (as well as Residential & Commercial)

As stated in our September comments, we strongly recommend the CHS apply to all thermal uses across the residential, commercial and industrial sectors. We recognize that MassDEP appears to be proposing that the emission reduction standard apply to just residential and commercial sectors. That begs the question of how comparable reductions in emissions from the industrial sector would be achieved. We request that MassDEP articulate how thermal emissions are expected to be reduced in the industrial sector – at the pace and scale needed to achieve Massachusetts' emissions reduction mandates – before concluding that they will be omitted from the scope of the clean heat standard.

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[3] U.S. Energy Information Administration, 2020 Residential Energy Consumption Survey, Table CE4.6.ng.st (https://www.eia.gov/consumption/residential/data/2020/state/pdf/ce4.6.ng.st.pdf).

[4] U.S. Energy Information Administration, 2020 Residential Energy Consumption Survey, Table CE4.7 (https://www.eia.gov/consumption/residential/data/2020/state/pdf/ce4.6.ng.st.pdf). The "northeast" includes both New England and mid-Atlantic states. More Massachusetts specific data could be used to refine these values.

### Shift More of the Obligations in 2030s to Fossil Fuel Suppliers, Less on Electric Utilities

We suspect that MassDEP's rationale to include electricity utilities as obligated parties is to address the potential for high fossil fuel prices in the future as the cost of fossil fuel supplier investments in clean heat measures get spread across a shrinking volume of sales. However, we are concerned that the proposed pace at which the electric utilities' obligations would grow is too fast, that the magnitude of the obligation on gas utilities and other fossil fuel suppliers begins to decline too soon, and that the portion of total clean heat investments required by electric utilities by 2040 is too high. Specifically, as the tables below show, it appears as if the MassDEP proposal would hold the electric utilities responsible for more than half of all new home electrifications by 2032 and for more than half of all emission reductions by 2033; by 2035, the electric utilities would be responsible for 70% of all new home electrifications and 75% of all emission reductions. By 2040, the electric utilities would have been responsible for two-thirds of all residential electrification projects and nearly 70% of all emission reductions. Those percentages are even higher by 2050.

**Table 2: Thousands of Residential Heating Systems Electrified**

| Obligated Parties | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 | 2039 | 2040 | 2026-2040 Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Electric | 16 | 22 | 28 | 34 | 40 | 46 | 52 | 58 | 64 | 70 | 76 | 82 | 88 | 94 | 100 | 870 |
| Fossil Fuel | 4 | 18 | 32 | 46 | 60 | 54 | 48 | 42 | 36 | 30 | 24 | 18 | 12 | 6 | 0 | 430 |
| Total | 20 | 40 | 60 | 80 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 1300 |

**Table 3: Millions of Tons of Emission Reduction**

| Obligated Parties | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 | 2039 | 2040 | 2026-2040 Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Electric | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.5 | 3.0 | 4.5 | 6.0 | 7.5 | 9.0 | 10.5 | 12.0 | 13.5 | 15.0 | 82.5 |
| Fossil Fuel | 1.0 | 2.0 | 3.0 | 4.0 | 5.0 | 4.5 | 4.0 | 3.5 | 3.0 | 2.5 | 2.0 | 1.5 | 1.0 | 0.5 | 0.0 | 37.5 |
| Total | 1.0 | 2.0 | 3.0 | 4.0 | 5.0 | 6.0 | 7.0 | 8.0 | 9.0 | 10.0 | 11.0 | 12.0 | 13.0 | 14.0 | 15.0 | 120 |

Thus, we recommend that the size of fossil fuel companies' collective obligations for both electrifying homes and emission reductions be larger than electric utility obligations until 2040. We also recommend that MassDEP commit, as part of its 2028 review and all subsequent reviews, to consider whether additional shifts in obligations from electric utilities to fossil fuel suppliers are necessary to ensure that electrification economics are compelling enough for customers.

### Add Lifecycle Accounting and Other Guardrails for Use of Biofuels

As explained in our September comments, we believe that the allowance of biofuels for compliance should include significant guardrails. These include:

- Requiring a lifecycle accounting of GHG emissions,
- Limiting credit eligibility to only existing sources,
- Precluding biofuels from receiving CHS credits if they are shown to create other environmental and/or social harms,
- Establishing maximum lifecycle carbon intensity scores for biofuels, and
- Capping the percentage of credits from/constraining applications of biofuels.

We highlight that MassDEP's current proposal is to credit eligible waste-based biofuels on the "assumed avoidance of all emissions from combustion of an equivalent quantity of heating oil. Other liquid biofuels eligible for the federal Renewable Fuel Standard would receive half credit through

2030 only."[5] We recommend that – as a minimum change – MassDEP credit biofuels based on a lifecycle emissions analysis. Such lifecycle emissions crediting should begin on "day 1" of the policy implementation.

We recognize that MassDEP's initial proposal is purposely designed to be relatively simplistic so that emissions reduction mandates and electrification projects are "kick started" in the near term. Thus, we understand the rationale behind MassDEP's proposal through 2028 and are interpreting the current proposal as it relates to biofuels to be an interim decision. We request clarification of that point. At present, the Framework document states[6]:

> D. The final regulation would include a requirement to consider expanding eligibility to other fuels in a required 2028 program review. Fuels would be evaluated based on the following considerations:
>
> 1. Lifecycle analysis of the greenhouse gas emissions associated with producing and utilizing the fuel, including the time frame of the assessment.
> 2. Detailed analysis of fuel availability, including the status and potential timeline for production projects and analysis of alternative uses of the fuel.
> 3. Any local air pollution impacts from production or combustion of the alternative fuel.

If MassDEP is not prepared to initially credit biofuels based on a lifecycle emissions analysis, we strongly encourage that the 2028 review[7] not only be focused on whether the range of biofuels eligible for clean heat credits could be expanded but to also:

- Assign emission reduction credits for ***all*** biofuels – including those approved as creditable starting in 2026 – based on lifecycle analysis of greenhouse gas emission reductions rather than deeming emission reductions as either 100% of 50% of displaced fossil fuels;
- Prohibiting crediting of ***any*** biofuel – including those approved as creditable starting in 2026 – if it produces not only significant adverse local air pollution impacts but also any other substantial environmental and/or social harms.[8]

## Alternative Compliance Payment for Residential Heating Electrification is Too Low

The alternative compliance payment (ACP) level of $6,000 for a residential space heating project is too low. Full electrification of an existing residential home will typically cost substantially more than $6,000. For the CHS to result in obligated parties installing clean heat measures rather than paying the ACP, the ACP needs to be set at a cost that is higher than the clean heat installation. For example, MassDEP could set the ACP at $12,000 for market rate units and $18,000 for low-income units. Additionally, we recommend a check back mechanism that examines the cost of electrification, allowing for an adjustment to the ACP in future years.

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[5] MassDEP CHS Draft Framework for Stakeholder Comment Only. November 2023. P. 6.
[6] Ibid. p. 5.
[7] We understand that MassDEP is suggesting additional reviews occur every five years. Given the complexity of the policy, uncertainty about how energy markets will change and the critical imperative of achieving emission reductions, we recommend that reviews continue every three years, at least for a couple additional review cycles.
[8] We note that terms like "significant" and "substantial" are open to interpretation and should be carefully defined before a final decision is made.

### Weatherization Normalization is Not Necessary

In Section IV(E) of its proposal, MassDEP states that a "credit multiplier" would be used when assessing whether an obligated party has met its emission reduction obligation in a cold winter. We are confused by this proposal. MassDEP is using the average savings of 5 MT per residential space heating electrification project. That should reflect expected average emission reductions for average winters. If the emission reduction obligation is also established based on average winter weather, which appears to be the case since it is based on current average annual emissions from building fossil fuel use, then there is no need for credit multipliers. Put another way, when both the credits earned per measure and the goals that need to be met across all measures are specified in terms that are already weather normalized, the reality that some winters will be colder than normal, and others will be warmer than normal should not matter.

That said, it is possible that we are misinterpreting the way that MassDEP is suggesting the emission reduction goals would be set. Is MassDEP anticipating that compliance with emission reduction goals would be based on actual changes in annual fossil fuel sales (rather than meeting pre-specified targets based on average historic annual emission levels). If so, we suggest that adds unnecessary complication. Moreover, if that is the proposed approach, it would be problematic to provide credit multipliers for colder than average winters without also reducing credit values for warmer than average winters.

### Limit the Number of Banked Credits that Can be Used in Any Given Year

While we understand the rationale for unlimited banking of credits, we suggest that the approach to banking be further defined such that only a certain amount of banked credits can be used in any one year. This could be, for example, 30% of an obligated party's annual credit requirements. Allowing for limitless banking without a constraint on how many banked credits can be used each year can result in too great a fluctuation for the heat pump and other relevant markets. Providing a maximum annual amount to banked credits can help guard against this fluctuation, thereby providing a more consistent market signal.

### Consider Adding Moderate-Income Carve-Out as Well as Low-Income Carve Out

We strongly support MassDEP's proposal to include a low income carve-out for residential heating electrification projects. The 25% carve-out value appears to be approximately equal to the fraction of Massachusetts households with incomes at or below 200% of federal poverty guidelines[9] (what we believe is analogous to income levels that would be eligible for discount electric rates). However, we are concerned that this proposal does not take into account the Massachusetts households that have incomes just above levels necessary for discount electric rates; these households may also be disproportionately underserved. Thus, we recommend that MassDEP consider adding an additional

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[9] https://datacenter.aecf.org/data/tables/10375-people-in-poverty-or-near-poverty-200-poverty-threshold-by-city-and-town-county-subdivision#detailed/2/any/false/2026,1485,1376,1201,1074/any/20043,20044

carve-out for such moderate-income households (e.g., those with incomes between 200% and 300% of federal poverty guidelines). We appreciate that this would add complexity, including the need to develop a mechanism for qualifying such households.

Respectfully submitted,

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December 21, 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") appreciates the important efforts of the Massachusetts Department of Environmental Protection ("MassDEP") to examine the future of clean heat in the Commonwealth of Massachusetts. Eversource welcomes the opportunity to comment on the Clean Heat Standard draft framework ("Framework") and values the efforts by MassDEP to inform the public and engage stakeholders on the development of this important standard. The opportunity exists to create a standard that is part of a comprehensive approach - where customer facing efforts such as Mass Save offerings help to overcome initial barriers and provide quality assurance, the Clean Heat Standard utilizes market forces to send the needed price signals for various heating fuels, and the gas local distribution companies ("LDCs") are engaged along with other market actors to actively participate with decarbonization solutions. In addition to providing these initial comments, Eversource is willing to regularly engage in further discussions on effective options for the Clean Heat Standard.

Eversource's comments are primarily focused on the Framework's limited eligibility, the ability of LDCs to generate credits, and the interplay and possible conflict of the Clean Heat Standard with the Mass Save® program. Eversource will also provide joint comments along with its fellow energy efficiency Program Administrators focused on the impacts of the Clean Heat Standard proposal on the Mass Save program.

Decarbonization of the building stock and the transition to clean heating for customers and end-users will require multiple complementary approaches. Building owners face two primary challenges when undertaking decarbonization, the first is upfront barriers such as initial cost, time and knowledge, and the second is operating costs where customers are driven to utilize fuel sources that align with their economic interest. As currently designed it is not clear that the Clean Heat Standard directly addresses either of these challenges. In fact, it appears to create the potential for market conflicts and customer confusion with the Mass Save programs that currently assist customers with up-front barriers while also putting additional upward pressure on electric rates. Additionally, MassDEP notes in the Frequently Asked Questions document, "electricity sellers are expected to comply mostly through credit purchases." This response indicates the Framework is intended to place a significant burden on electric suppliers to purchase credits. As constructed, the Framework will likely increase electric rates, increasing operating costs of electric heat which is counterproductive to the Commonwealth's electrification goals. A third element of a holistic approach to decarbonization would also include a mechanism for active participation through credit generation by LDCs.

**Multiple Pathways to Reduce Emissions are Necessary.**

As discussed in Eversource's previous comments, the Commonwealth should ensure that any standard or program established as the Clean Heat Standard remain technology agnostic. By remaining technology agnostic, the Commonwealth can promote innovation in an ever-evolving market. Moreover, it allows for customers to maintain a level of customer choice while pursuing decarbonization, thereby increasing the likelihood of customer conversion.

The Clean Heat Standard will serve as an important tool in the Commonwealth's arsenal and will need to be nimble to pivot as new technologies advance. At present, the Framework provides limited eligible technologies. The Framework notes MassDEP will re-evaluate technologies in 2028 and every five years thereafter. Respectfully, Eversource recommends technologies be evaluated sooner than 2028 and more frequently than every five years. As MassDEP is aware, this is a rapidly evolving market and, if the Commonwealth is to achieve its goals as expeditiously and cost-effectively as possible, the Framework should not limit customer choices to those prescribed and updated only every five years.

Additionally, there is no standard emissions accounting framework offered across all technologies so that customers and suppliers could compare their options. Having a standard emission accounting framework that includes the ability to earn credits on all acceptable decarbonized options, while more frequently reviewing the program, will better enable the Commonwealth, and companies like Eversource, who share emissions reduction targets, to reach our goals more efficiently.

We look forward to ensuring that the grid can accommodate a decarbonized heating load along with the multiple other facets of clean energy integration. A technology agnostic approach to the Clean Heating Standard could allow a broader array of customer choices to reduce emissions as efficiently as possible while simultaneously ensuring the needed infrastructure upgrades are realized.

Finally, the Framework needs to take into consideration and ensure alignment with recent and pending regulatory and legislative decisions, such as, but not limited to, the recent D.P.U. 20-80 order on the Future of Gas docket and the pending DOER Fossil Free Demonstration Program.

**Clean Heat Credits**

Eversource understands the current Framework to have two forms of credits: (1) the full electrification credit and (2) the emission credit. The full electrification credit is generated at the time of heat pump install and the emission credit generated every year thereafter for the emissions saved. Additionally, the delivery of eligible liquid biofuels would generate an emissions credit.

Eversource has several concerns regarding credits – the limited options for LDCs to generate credits, credit attribution through Mass Save, and the tradeable nature of the credits.

Although further clarification is needed, it appears the Framework allows minimal options for LDCs to generate any credits despite the fact they are being directed to provide decarbonization solutions for customers. For example, if an LDC were to construct a networked geothermal system (highlighted in the Future of Gas docket as a potential just transition and electrification strategy for the natural gas utilities) wherein each customer received a Mass Save incentive, the Framework implies that the credits would be assigned to Mass Save. There does not appear to be any mechanism for the LDC to receive credit in such a scenario where innovative clean technologies are introduced beyond energy efficiency electrification offerings e.g., networked geothermal. The Framework is therefore designed in such a way that instead of encouraging layering of incentives, it explicitly disincentivizes such action.

Eversource requests more information around how MassDEP intends to attribute credits for Mass Save projects that are Clean Heat Standard eligible. The Framework Section II.C. is ambiguous and states the credits will belong to property owners but also "would be assigned to retail natural gas or electricity sellers in proportion to their compliance obligations." As drafted, it is unclear how this assignment and subsequent allocation would work and additional details on how MassDEP would make this determination are requested. For example, if a retail supplier discontinues operations will their allocated credits revert to the Mass Save Program Administrator? Eversource recommends that MassDEP revise the Framework to allow the Program Administrators, including electric Program Administrators, to sell and earn Clean Heat Standard credits to offset program costs, instead of allocating the credits to retail suppliers.

Eversource has concerns that a portfolio standard with tradeable credits may be a poor match for encouraging the development of a sustained, orderly clean heating market in the Commonwealth. The past decade and a half of clean energy policy implementation has proven that tradeable credit markets can place substantial incentive price risk on entities investing in clean energy technologies. In recognition of the inherent challenges of tradeable credit market policies, the Commonwealth has implemented numerous co-policies to overcome these deficiencies.[1]

Customers and clean heating contractors are not energy policy experts and do not regularly participate in credit trading markets. Any Clean Heat Standard policy should be designed to ensure that incentives are easily understood and accessible to contractors and customers. Experience developing and implementing, solar, electrification and efficiency incentives over the past decade has proven that effective programs must meet customers and installers where they are and not require them to navigate elaborate and potentially confusing policies that create uncertainty and insert risk into their decision making. Portfolio standards that do not include tradeable credit markets may be a better fit for the Clean Heat Standard.

[1] Some of these co-policies include the long-term clean contracting obligations as well as the complex auction mechanisms in both the SREC I and SREC II programs. Notably, the Commonwealth's most recent solar incentive recognized the limitations of tradeable credit markets by abandoning the concept entirely. Further, the SMART program eliminated incentive price risk for customers and established a long-term tariff for solar project owners that provided incentive value certainty.

**Mass Save®**

Eversource, as a Mass Save Program Administrator, has several concerns about the potential impact and overlap of the Clean Heat Standard and Mass Save. The Clean Heat Standard should coordinate and align with Mass Save, where possible, to ensure the Clean Heat Standard does not set targets that differ from or contradict Mass Save goals. Mass Save has set heat pump targets through extensive stakeholder engagement, the Energy Efficiency Advisory Council and the equity working group. The Clean Heat Standard should be consistent with the Mass Save targets.

Additionally, Eversource recommends any install verification measures align with Mass Save's robust verification process. High quality installations that are properly sized are critical if the Commonwealth is going to actually achieve the carbon reductions needed from electrification of heating systems. If the Clean Heat Standard creates different or conflicting quality assurance and verification processes, it will significantly increase the administrative burden and potentially create confusion in the market.

Eversource encourages the MassDEP to coordinate the Clean Heat Standard as closely as possible with Mass Save to ensure Clean Heat Standard doesn't confuse the market, undermine Mass Save efforts, or create duplicative incentives at the expense of ratepayers. With the development of the Clean Heat Standard the opportunity exists to build upon and leverage the existing infrastructure of the Mass Save programs that are focused on addressing customer barriers and installation quality. If the design of the Clean Heat Standard focuses on utilizing market forces to impact long term fuel costs to drive decarbonization while the Mass Save programs facilitate installations, Massachusetts can create a comprehensive approach that creates a strong opportunity for successful attainment of the climate goals.

**Affordability and Equity**

Eversource is concerned the Clean Heat Standard takes too narrow of an approach to equity. The Framework provides an "equity carve-out" which requires 25% of the total full electrification requirement to be directed to low-income customer households. An equitable clean heat transition should include more comprehensive view of equity, including other vulnerable customer segments and an assessment of the energy burden from potential decarbonization pathways rather than a carve out for only low-income customers. Eversource encourages MassDEP to broaden its concept of low-income customers to account for a critical pool of low-income individuals, namely residents of large multifamily residences because they are typically served on commercial meters, not residential meters.

Eversource appreciates the opportunity to comment on this important standard and partner with the Commonwealth in the achievement of its critical climate goals. Eversource looks forward to continuing to work collaboratively with stakeholders and MassDEP on the development of the Clean Heat Standard.

Sincerely,

Nikki Bruno
Vice President, Clean Technologies

Tilak Subrahmanian
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December 20th, 2023

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Re: Clean Heat Standard Testimony

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Thank you for the opportunity to submit comments on this initial draft of the Clean Heat Standard. I am concerned about climate change, and as such am grateful to both EEA and the MassDEP for working to establish a program targeting fossil heating fuels within our Commonwealth. However, I am deeply disappointed that, despite considerable science-based evidence regarding the merits of modern wood heating, the Department has chosen not to include it within the proposed programmatic framework.

I appreciate the Department has made numerous opportunities for public engagement. Accordingly, I have submitted comments in support of modern wood heat's programmatic inclusion, citing extensive peer-reviewed research validating the decarbonization potential of wood, which in Massachusetts is almost exclusively "waste based" -residues from the sawmill and arboriculture sectors. This fact can be easily found within the State-funded Manomet Report (2010) which despite opposing the use of biomass for power generation, recognized the significant GHG benefits of wood heating. Further evidence includes a 2017 *Energy* publication titled: Greenhouse Gas Emissions of local wood pellet heat from Northeastern US forests (Volume 141, 15 December 2017, Pages 483-491) which quantified immediate and significant GHG emissions reductions when switching from fossil fuels to modern wood heating.

It is equally notable that this decarbonization virtue is recognized by the Massachusetts Clean Energy Center (MassCEC) by referring to modern wood heat as a "clean heating technology" and explicitly recognizing the merits of wood to displace conventional heating on their GoClean webpage. In fact, MassCEC data (2020) shows that modern wood heat provides greater carbon reductions than air-source heat pumps (using grid electricity). While I can appreciate that reviewers will endorse electrification by suggesting that the grid is becoming greener with every passing day. However, the inconvenient truth is that the load growth from the (virtuous) adoption of heat pumps and electric vehicles now outpaces novel green generation, reducing the fraction of our power that is deemed renewable. This is regrettable as in 2022 only 19% of ISO New England's power was considered renewable (including WTE power). That said, I support the notion that heat pumps will account for the lion's share of new residential heating across the Commonwealth. However, for a variety of reasons, both logistical and cultural, this approach will not be universally adopted.

In recognition of diversity, I would like to applaud the DEP for its inclusion of waste-based liquid biofuels in the CHS. However, the rational for this inclusion also applies to wood fuel. In fact, nearly 100% of the fiber listed on the Commonwealth's Biomass Registry used for heating may be deemed waste-based (referred to as "residues" in DOER parlance) originating from the sawmill and arboricultural sectors. I also wish to point out that all the pellet fuel involved in the APS is produced by a single company called Lignetics at three of its most local mills located in Strong ME, Jaffrey NH, Schuylerville NY. To facilitate the CHS, Lignetics has pledged to provide data ensuring that their feedstock is sufficiency "Waste Based" to meet programmatic expectations.

In response to stakeholder pressure regarding the negative health effects of airborne particulates from modern wood heating systems within sensitive populations (as defined within the APS, 225 CMR 16.00) the DOER and MassCEC commissioned Dr. Richard Peltier of the UMass Amherst School of Public Health to evaluate the local air quality impacts for Massachusetts schools that chose to replace their oil boilers with pellet boilers (2017-18). Subsequent air sampling easily distinguished between the PM2.5 emitted by the boilers and the PM2.5 from other sources (vehicles, distillate heating systems, wind-blow soil). This distinction can be explained by recognizing that PM2.5 is simply a size descriptor and not a measure of toxicity. The UMass Amherst study found that when schools switched from oil to wood, their air quality typically *improved* compared to the previous oil systems. Dr. Peltier further hypothesized that the associated particulates were less dangerous to human health than the fossil-combustion particulates from the previous systems.

> "Concentrations of PM were generally low, and at smaller magnitudes to other sources of pollution."
>
> &
>
> "The use of pellets has a measurable effect on air quality, but it is of a smaller magnitude than other commonly used heating appliances such as distillate".

Dr. Peltier's findings are supported by numerous studies examining differences in PM2.5 toxicities. One of the largest domestic investigations (Thurston et al., *Environmental Health Perspectives,* vol. 124, Number 6, June 2016) followed nearly half a million Americans for 22 years, from 100 municipalities. The study concluded that PM2.5 resulting from coal and diesel combustion (thermal & transportation) were significantly correlated with heart disease. However, the study found find <u>no such link</u> between wood combustion and heart disease – the number one killer of Americans. I hope that the DEP will distinguish between different types (species) of PM2.5, instead of assuming universal toxicity.

Biogenic fuel combustion is not the cause of climate change…but its responsible use can help mitigate the effects; renewable fuels are always better than the fossil alternatives. I urge MassDEP to recognize the virtue of waste-based, solid biofuels by amending the drafted Clean Heat Standard to include modern wood heat. This inclusion will affect a minority of homes within the Commonwealth (5-7%), enabling those households to deploy best-in-class technologies.

Thank you for the opportunity to provide testimony,

Jonathan Parrott, Ph.D.
Flat Rock Farm, Chesterfield MA

The following letter was submitted to MassDEP by 50+ Massachusetts residents.

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**Subject:** MA Homeowners for Bioheat

Dear MA null DEP,

As a MA resident whose family is reliant upon liquid heating fuel, I'm asking that you please read the following CommonWealth Magazine op-ed on an affordable, expedient decarbonization tool that makes the most sense for me and for hundreds of thousands of homeowners across the Commonwealth.

We need our elected officials to demand a Clean Heat Standard that expands, rather than diminishes, the adoption of renewable liquid biofuels to ensure that “clean heat” is an achievable standard for all.

https://commonwealthmagazine.org/opinion/unjamming-the-heating-oil-industrys-road-to-carbon-neutrality/

Many thanks for your attention,
[signature and homeowner address]

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The following letter was submitted to MassDEP by 250+ propane users.

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**Subject:** Any rationale CHS should support, not penalize, the use of low-carbon propane!

Dear Commissioner Bonnie Heiple,

As a propane user in Massachusetts, I am very concerned that the Clean Heat Standard (CHS) framework being proposed by the Department of Environmental Protection (DEP) will reduce consumer choices, increase consumer prices, and increase climate emissions if propane is penalized.

While I support efforts to reduce emissions and safeguard the environment, the CHS will artificially create advantages for electricity yet disadvantages for cleaner propane. This would be a detriment to both cost-conscious energy consumers like me and the climate. Propane today is cleaner than electricity in Massachusetts, and renewable propane blends will keep propane cleaner than electricity in the future. Renewable propane blends should be given maximum credits to incentivize the innovative ways we can make renewable propane. From using recycled plastic drinking bottles to carbon capture, there are exciting innovations today that should be incentivized by DEP. Making me pay a credit that could potentially raise my price or switch to a dirtier energy source will increase carbon emissions and does not meet your climate goals.

Combustion fuels are not all the same and propane should be part of your solution under the CHS! Propane is a beneficial by-product left over from other fuels and if we don't use it for energy, it is wasted. Propane is already at work reducing GHG emissions in my home and should be incentivized under the CHS. Conventional propane that I use today has a carbon intensity (CI) score of only 77, compared to 100 for grid electricity that is generated in Massachusetts. And renewable propane, which is derived from non-fossil sources, such as used cooking oils, plants, recycled plastic bottles, and trash, has an even lower CI score. In fact, it is as low as 21. Today, 66% of bulk power in our state comes from burning fossil fuels, including natural gas and petroleum. Surely any state policy seeking to reduce GHG emissions would include, not exempt, associated emissions from power producers. Given the long atmospheric lifespan of carbon, it makes no sense to penalize the delivery of propane.

Consumers should have a choice! Energy reliability, resilience and security is best achieved through energy diversity. Propane generators, fireplaces, cooktops, and heaters provide robust reliability during inclement weather and natural disasters, and state officials must take this into account. Notably, propane actually reduces stress on the electric grid and helps it cope with peak demand. This is especially valuable in a place like Massachusetts that is home to aging electric infrastructure. This is all at risk with the DEP's actions. To ensure the safety and provide critical energy security to our vulnerable citizens, the framework should exempt all households that have a propane backup generator.

Any rationale CHS strategy to reduce carbon emissions must incentivize not penalize the use of propane, as it would be counterproductive and result in numerous adverse impacts for residential and commercial energy consumers.

Thank you for your consideration.

Regards,
[signature and homeowner address]

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The following letter was submitted to MassDEP by 400+ Massachusetts residents and small business owners in the heart, fireplace, and patio industry.

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**Subject:** Please Consider the Impact of the Clean Heat Standard on the Fireplace Industry and Residents of Massachusetts

Dear Department of Environmental Protection members, As a Massachusetts resident and small business owner in the hearth, fireplace & patio industry, I am writing to express my concerns regarding the DEP's Clean Heat Standard. While I strongly support climate action, forcing Massachusetts residents to phase out and replace their gas fireplace products by increasing the cost of fuel does more harm than good. In addition to driving up the cost in the short term of operating Gas Fireplaces as an essential backup heat source, the Clean Heat Standard would devastate the locally owned and operated fireplace retailers in the Commonwealth. Further, this plan is essentially a tax on all Massachusetts residents without the assurance of emission reductions. The CHS completely ignores the carbon intensity of electricity generation from the grid while simultaneously excluding biomass, which qualifies for a federal tax credit in the Inflation Reduction Act. In fact, the CHS draft framework states that "standards would be inclusive of clean heat supported by other programs, such as federal tax credits." We agree with these inclusive standards. The federal Biomass Tax Credit, included in the Inflation Reduction Act, strengthens our case that biomass should be included in the Clean Heat Standard. This type of forced electrification jeopardizes businesses and residents' ability to choose affordable, reliable heating. In your capacity, and as representatives of Massachusetts, please think about the impact of the CHS on small businesses, jobs, Massachusetts residents, and consumer choice. Please consider revising the Clean Heat Standard to include more affordable home heating options. Thank you. Sincerely, [signature]

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The following letter was submitted to MassDEP by 2,500+ homeowners.

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**Subject:** Homeowner Concerns RE: the MA Clean Heat Standard

Dear MA null DEP,

As a Massachusetts homeowner, I'm asking that you address my concerns regarding the Clean Heat Standard being proposed by the Department of Environmental Protection.

Like many across the Commonwealth, I have long depended upon heating oil provided by a local business – also from MA – to keep my family warm from October to April each year. Not only has this been a reliable and affordable option that supports our local economy, but I also believe it is the right choice from an environmental perspective.

With clean, renewable Bioheat fuel, our heating oil provider is helping us to decarbonize our home right now - more affordably and more quickly than if we were to convert our home to electric heat pumps and wait on decarbonization of the power grid. Rather than mandating that a percentage of heating oil customers convert to heat pumps each year, the Clean Heat Standard would do better to mandate that a percentage of customers transition to Bioheat – which is commercially available today at increasingly clean blends and requires no modifications to heating systems such as mine.

Across our region and country, headline after headline addresses the enormous obstacles that continue to slow our progress towards achieving a 100% renewable power grid. So why push millions of more homes onto the grid when there is a more affordable, cleaner option that offers immediate decarbonization without the cost of conversion?

Rather than steering us towards a singular point of failure, we should be encouraging growth, technology, and advancement in areas that make the most sense. In a state where the liquid fuels infrastructure, distribution network, and workforce is already in place, renewable biofuels should absolutely be part of the equation. Any comprehensive clean energy policy should be diverse and include low-carbon biofuels, as well as other renewable liquids and gases.

Many thanks for your attention,
[signature and homeowner address]

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Global Partners LP
800 South Street, Suite 500
P.O. Box 9161, Waltham, MA 02454-9161
www.globalp.com

December 20, 2023

Bonnie Heiple, Commissioner
Massachusetts Department of Environmental Protection (DEP)
100 Cambridge St #900
Boston, MA 02114

Subject: Comments on Draft Program Framework and Costs and Emissions Associated with Different Heating Technologies

Dear Commissioner Heiple,

Global Partners LP (Global) appreciates the opportunity to present comments on the Massachusetts Clean Heat Standard's (CHS) Draft Program. 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 everythingwe do. We are proud to support the communities in which we live, work, and contribute. 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 thesame 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, 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 also 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.

Our comprehensive view is that emission reduction goals are best accomplished through performance-based programs, like the California Low Carbon Fuel Standard, that avoid specific technology choices and take into account flexibility for credit acquisition and eligibility. Despite open competition delivering the cleanest fuels at the lowest cost to citizens, the draft framework disincentivizes certain fuels regardless of their carbon footprint. To our knowledge, the DEP has not released any methodology or lifecycle analysis to justify this disparate treatment. Topic III: Credit Generation Part F establishes that waste-based biofuels

[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
[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.

earn a full credit, while crop-based biodiesel that historically qualifies under the Renewable Fuel Standard is only given half a credit. This arbitrary restriction on valid and qualifying fuels eliminates the option of more cost-effective choices for consumers to meet pressing GHG emissions goals. Finally, the final regulation requires a 2028 program review that must consider expanding eligibility to other fuels; however, it is irrational to purposefully limit the market prior to this review, and the program should instead review the effectiveness (by cost, emissions, or any other agreed-upon metric) of the fuel pathway once it can be analyzed over multiple years in the program.

Additionally, the electrification pathway is treated in a privileged manner within the framework. The text essentially scores the grid as zero-carbon with how it treats regulated heating energy suppliers versus electricity suppliers. However, this carbon needs to be accounted for, as in Massachusetts, about two-thirds of the electricity produced in the state in 2020 was fueled by natural gas.[4] It further only credits early action projects that constitute full electrification, ignoring the advantages of utilizing the existing liquid fuel infrastructure and the benefits of immediate emissions reductions through the benefits of the TVC. Furthermore, the assumption in Topic III: Credit Generation Part F that a single residence would be credited for an emission reduction of 5 MT per year is inaccurate. Although the rule attempts to navigate credit generation in an equitable manner by restricting larger property owners, who are oftentimes wealthier, from generating more credits, it overestimates fossil fuel emissions from apartment and smaller residence owners. This is a substantial segment of the population, as in 2019, approximately 37% of households were apartment renters,[5] giving further preferential treatment to electrification projects.

Finally, we also wanted to raise a point concerning the memo titled *Data for Use in Economic Analysis of a Clean Heat Standard* from Sustainable Energy Advantage of Synapse Energy Economics.[6] Under the Bioheating Oil section on page 17 of the document, the memo reads, "We assume a current heating fuel oil blend of B5 (i.e., five percent biodiesel). Biodiesel blends above 20 percent (e.g., B100) require changes to customer equipment, which we expect would be a significant barrier to adoption of those blends". We push back on this baseline assumption for a multitude of reasons, as this language decreases the opportunities for biofuels to qualify for compliance under the CHS. B5 is not an appropriate baseline for heating oil carbon intensity because blending in the state is discretionary without a set mandate. In closing, biofuels cannot be shipped on the Jetline, which supplies the Springfield terminal market and causes further market uncertainties. In closing, we contend that the baseline should be set at B0, as this embraces all products in the market through a technology-neutral process.

Overall, the draft framework and economic analysis memo fail to address overall costs to retail marketers and consumers and intentionally erode existing customer bases through prescriptive policy design. Realistic policy design that provides all obligated parties a seat at the table and viable pathways for their solutions is necessary to enact an effective CHS. Thank you again for considering our views and experience. If you have any questions, please do not hesitate to contact me directly at Drew.Carlson@globalp.com.

Sincerely,

Drew Carlson
Vice President of Government and Community Affairs
Global Partners LP

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[4] Boston Solar. "Where does my electricity come from in Massachusetts?," September 15, 2022. https://www.bostonsolar.us/solar-blog-resource-center/blog/where-does-my-electricity-come-from-in-massachusetts/#:~:text=Massachusetts%20relies%20heavily%20on%20natural,%2C%20oil%2C%20and%20nuclear%20power

[5] Massachusetts residential rent and Rental Statistics. Department of Numbers. (n.d.). https://www.deptofnumbers.com/rent/massachusetts/

[6] Massachusetts Department of Environmental Protection. (2023, May 8) Data for Use in Economic Analysis of a Clean Heat Standard. https://www.mass.gov/doc/memo-on-heating-technology-costs-and-emissions/download

# GOOD WOOD COALITION

December 21, 2023

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

The **Good Wood Coalition** is a group of businesses, conservation groups, nonprofit organizations, farms, renewable energy advocates, and forest products companies who support the thermal use of wood as an effective decarbonization measure. We were disappointed to see that modern wood heat and pellet stoves were not included in DEP's Clean Heat Standard draft, and **we urge DEP to reconsider this decision**, **as it is <u>not</u> supported by science and makes the Commonwealth's aggressive climate change mitigation goals more difficult to achieve.**

DEP was charged with developing a Clean Heat Standard (CHS) in the 2025/2030 Clean Energy and Climate Plan (from a strong recommendation in the Clean Heat Commission's final report). Neither of these reports contained directions to limit clean heating technologies to **<u>only</u>** heat pumps, leaving the choice to include other clean heating technologies in DEP's hands, as it has chosen to do with some liquid biofuels.

Confusingly, the consulting group Regulatory Assistance Project (RAP) produced an initial overview of the CHS program for DEP, and in their materials and videos mentioned other clean heating technologies appropriate for inclusion such as solar thermal and advanced/modern wood heat. Additionally, in its draft framework, DEP says: *The standards would be inclusive of clean heat supported by other programs, such as federal tax credits.* Modern wood heat is included in the APS, and **both modern wood heat and pellet stoves are eligible for federal tax credits aimed at renewable clean heat**.

We appreciate the public process DEP has conducted around the CHS, including asking for input on included technologies. A number of our coalition members submitted comments to DEP, supporting the inclusion of modern wood heating in the CHS. They cited extensive peer-reviewed research showing that it is a significant decarbonizer; is the cleanest available wood heat technology; relies heavily on waste-based sawmill and forestry residues; is the cheapest heating fuel available for those without access to natural gas (very important for the rural poor); and has important benefits for the electric grid, particularly in rural areas.

Despite this feedback, DEP issued a draft CHS framework that excluded technologies such as solar thermal and modern wood heat in favor of only heat pumps and some liquid biofuels. This is out of alignment with other New England states, which have included modern wood heat in their thermal renewable heating programs. Vermont recently included modern wood heat and pellet stoves in their own Clean Heat Standard because science clearly supports that inclusion.

Recently, the Healey Administration released a Climate Report Card examining progress reaching the state's ambitious climate change goals. At the press conference, Undersecretary for

Decarbonization and Resilience Katherine Antos was quoted as saying that the five years from 2025 to 2030 require the greatest proportional decarbonization progress of **all** the five-year periods from now until 2050. **Facing the greatest short-term decarbonization need of the next 25 years, why is DEP choosing to *deliberately slow-walk* decarbonization progress in the building sector?**

DEP's explanation for this choice can be found in their FAQ document and was reiterated during their technical session on December 7. They state that they judge technologies on three criteria: lifecycle greenhouse gas emissions analysis, fuel availability, and impacts on local air quality. They claim that they only have this information for air-source and ground-source heat pumps and some liquid biofuels. As a result, they cannot admit other technologies until this information can be produced, and they will hold off on that process for five years. Here is the problem with that rationale: **for modern wood heat, ALL of this information – in all three criteria – has already been extensively researched, often with state funds, and is readily available to DEP from its sister agency, the Department of Energy Resources (DOER).**

In making the decision to exclude modern wood heat (and other technologies), our concerns are that DEP relied on faulty, uninformed assumptions; made no effort to test these assumptions to make sure they were accurate; apparently declined to talk with subject matter experts at a sister EEA agency to gain from their hard-earned experience; and were unconcerned with speeding progress towards decarbonization goals by building in a five-year delay before even considering other clean heating technologies.

In comments submitted previously by the Massachusetts Forest Alliance (a Good Wood Coalition member) to DEP on the CHS, each of these criteria was addressed, with links to studies and other information. However, while DEP did read the comments (as apparent from summaries they created), they somehow missed the information related to these criteria and instead decided that they didn't have enough information to decide whether to include modern wood heat.

For greenhouse gas emissions, the evidence is clear that modern wood heat is a significant decarbonizer. State-funded research in **the *Manomet* report** cast doubt on the carbon impact of biomass power generation, but **showed significant decarbonization benefits from the high-efficiency thermal use of wood.** A **peer-reviewed study** in the journal ***Energy*** (with careful lifecycle GHG emissions analysis from the same prestigious lab used in the *Manomet* report) showed an immediate 50% carbon emissions reduction when switching from fossil fuels to modern wood heat. The Massachusetts Clean Energy Center recognizes the carbon benefit of modern wood heat, calling it a "clean heating technology" and showing the significant carbon emissions reductions from switching to modern wood heat from fossil fuels on their ***GoClean* residential energy website**. Their 2020 data shows that there is actually a **greater** carbon reduction by switching to modern wood heat today than by switching to air-source heat pumps using grid electricity, because a substantial amount of grid electricity is still made from fossil fuels. **The decarbonization benefit of modern wood heat has been clearly and thoroughly demonstrated by extensive peer-reviewed research and collected data.**

As for fuel availability, there seems to be questions related to the amount of liquid and gaseous biofuels that can be produced from limited feedstock, and whether that feedstock should be used for other purposes, such as sustainable aviation fuel. For wood, there is no such concern. Even if strictly limited to waste wood from sawmill and forestry residues as well as arboricultural wood waste from DPWs and tree service companies, studies have shown that there is **more than 3 million tons** of this material produced in Massachusetts alone – **every single year**. DEP has pointed out that every residence in Massachusetts has access to electricity. The same is true of wood, as DOER-approved suppliers will deliver to every household across the entire state. **Fuel availability is not a concern.**

DEP staff seemed to believe that there was no way to track the sustainability and provenance of the feedstock for modern wood heat and pellet stoves, but in fact this isn't true. DOER has strict regulations for systems in the Alternative Portfolio Standard, requiring that material be traced back to its source and certified as sustainable. There is a single pellet manufacturer approved to make all the pellets for the APS program. They can easily provide data on their feedstock to DEP, or DEP could simply adopt the same standards developed by DOER. DEP pointed to the value of waste-based liquid biofuels while casting doubts about other liquid biofuels during the December 7 technical session. If it eases concerns, **DEP can make the same determination for modern wood heat and pellet stoves, requiring a waste/residue-based feedstock, and tools are available to track that choice.**

The final element of the three criteria relates to impacts to local air quality. Modern wood heating systems are the cleanest wood-burning systems, emitting **99% less particulate matter** than an older wood stove per million BTUs of thermal energy. To answer concerns on the air impacts of modern wood heat, DOER commissioned an **air quality study by UMass Amherst's School of Public Health & Health Sciences**, examining rural schools that had switched from oil to pellet boilers for heat. Air sampling can easily distinguish between different forms of PM2.5 because they have entirely different chemical signatures – PM2.5 is simply a size descriptor. The UMass Amherst study found that **when schools made the switch from oil to wood, their air quality typically *improved* compared to their old oil systems**, and that the particulates were likely less dangerous to human health.

There are numerous studies examining differences in PM2.5 toxicity. One of the largest (**a peer-reviewed study in the journal *Environmental Health Perspectives***) followed 445,000 Americans for 22 years, with full access to their medical records, and tied those records to detailed measurements of air emissions data from the 100 metro areas where they lived. The study found that coal PM2.5 was clearly the most toxic, and emissions from oil were also seriously impactful to health. However, this exhaustive study was unable to find any link between PM2.5 from wood combustion and ischemic heart disease – the number one killer related to particulate matter exposure. Unfortunately, most policymakers do not distinguish between different types of PM2.5, choosing instead to assume a universal level of toxicity. This is simply not the case.

In the APS, DOER has strict air quality standards that must be met by modern wood heating equipment, requiring only the very cleanest systems to be used. **It would be simple for DEP to adopt these same air quality standards to address any concerns about air quality impacts from modern wood heat or pellet stoves.**

Beyond the three criteria, we believe there are other factors that DEP should be considering. The draft CHS and accompanying FAQ place a lot of emphasis on equity for lower-income residents, and this is to be commended. However, the focus on equity seems designed more for those living in poverty in urban and suburban areas and disregards the special needs of rural poverty. **What makes sense in Cambridge, Chelsea, and Chelmsford is very different from what will be**

**successful in Charlemont, Chesterfield, and Cheshire**. Governor Healey appointed Anne Gobi as the first Director of Rural Affairs, and while that is a positive step, regulatory agencies still need to pay more attention to rural issues in their policymaking.

Switching rural residents to electric heat and transportation will seriously test an already substandard rural electric grid. With few residents scattered across rural towns, upgrading electrical capacity is very expensive per household, which is why some rural communities are only just now getting broadband internet.

We were confused by the Synapse Energy Economics report, which appears to predict levelized electric rates and fossil fuel prices through 2050, despite acknowledging recent price volatility. Massachusetts ratepayers have seen costs rise by nearly 50% in recent years. It seems clear that with mandatory grid upgrades funded by ratepayers as well as increasing obligations from the RPS, APS, other programs, and now the CHS, the price of electricity will continue to rise. DEP acknowledged that this was a concern during the December 7 technical session.

Modern wood heating and pellet stoves have a positive effect not only on carbon emissions reductions, but economic value as well. While the up-front costs of installing a modern wood heating system are relatively high, the ongoing fuel costs are very low – lower than air-source heat pumps, especially as electric prices continue to increase. Wood fuel prices have substantially lower price volatility compared to fossil fuel prices and are relatively stable over time, tending to track with inflation. Because the fuel is produced locally, 100% of heating payments continue to circulate in the local economy, helping strengthen rural communities.

We've seen adoption of these systems not only by rural homeowners, but also by businesses, schools, public buildings, and farms. All of these users switched to modern wood heat from oil and have saved substantial heating dollars doing so – struggling rural municipalities in particular have used the savings for teacher salaries, building improvements, public safety investments, or tax relief.

As more and more people switch to electric heat, our grid will become a winter peaking system. That peak demand – which will occur on the coldest days, as air-source heat pumps become significantly less efficient and consume much more electricity – is often now met by "peaker plants" that are typically fueled with oil or even coal, and which charge vastly higher prices than normal electric generation.

Research **in Vermont** and **in France** demonstrates that wood heat can help smooth these peaks on cold days, avoiding costly grid upgrades and very expensive peak power supplies. With modern wood heat in rural areas, where the grid is already stressed, these advantages are multiplied. DOER has recognized this benefit of modern wood heat, and we believe DEP needs to factor it into the CHS as well.

It is clear that heat pumps – both air-source and ground-source – are the future heating technology for most Massachusetts buildings. We would not anticipate more than 5-7% of Massachusetts homes and businesses switching to modern wood heat or pellet stoves as their primary source of heat. Nevertheless, this small fraction is important to realize the maximum decarbonization benefits and offer flexibility for those at the end of a low-capacity rural electric grid.

For all these reasons, **we urge DEP to include modern wood heat and pellet stoves in the Clean Heat Standard.** Choosing to exclude this and other clean, renewable heating technologies will make it harder for the Commonwealth to reach its climate change mitigation goals at a time when every amount of carbon emissions reduction is precious.

Should you have any questions or would like to meet with members of our coalition to discuss this further and learn more, please contact Chris Egan at the Massachusetts Forest Alliance. He can be reached at (617) 645-1191 or cegan@massforestalliance.org.

Thank you for your consideration.

cc: Rebecca Tepper, Secretary for Energy and Environmental Affairs
Melissa Hoffer, Climate Chief
Anne Gobi, Director of Rural Affairs
Senator Michael Barrett, Senate Chair, Telecommunications, Energy, and Utilities Committee
Rep. Jeffrey Roy, House Chair, Telecommunications, Energy, and Utilities Committee

Sincerely,

| | | |
|---|---|---|
| **Massachusetts Forest Alliance**<br>Marlborough, MA | **Massachusetts Farm Bureau**<br>Marlborough, MA | **New England Forestry Foundation**<br>Littleton, MA |
| **W.D. Cowls, Inc. Land Company**<br>North Amherst, MA | **Massachusetts Tree Farm Committee**<br>Hawley, MA | **Ruffed Grouse Society/ American Woodcock Society**<br>Ware, MA |
| **Northern Tree Service**<br>Palmer, MA | **Mayer Tree Service**<br>Essex, MA | **Barry Equipment**<br>Webster, MA |

| | | |
|---|---|---|
| **Hull Forest Products**<br>Russell, MA | **Heyes Forest Products**<br>Orange, MA | **Lashway Lumber**<br>Williamsburg, MA |
| **Pirner Logging & Land Clearing**<br>Hubbardston, MA | **Ponders Hollow**<br>Westfield, MA | **New Day Energy**<br>Kingston, MA |
| **Roberts Bros. Lumber Co.**<br>Ashfield, MA | **Roberts Energy Renewables**<br>Ashfield, MA | **Eastern Biomass**<br>N. Oxford, MA |
| **Mill River Slabworks**<br>Westfield, MA | **Land Stewardship, Inc.**<br>Turners Falls, MA | **Atlantic Golf & Turf**<br>Turners Falls, MA |
| **Brewmasters Brewing Services**<br>Williamsburg, MA | **Saint Benedict Center**<br>Harvard, MA | **Elevated Design Inc.**<br>Quincy, MA |
| **Lashway Forest Products**<br>Williamsburg, MA | **Sandri Energy**<br>Greenfield, MA | **T. Jepson & Son**<br>Spencer, MA |
| **Caluwe Heat & Power Solutions**<br>Burlington, MA | **TTC Energy**<br>Windsor, MA | **D.H. Smith & Sons**<br>Marshfield, MA |

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| **Holiday Brook Farm**<br>Dalton, MA | **Simple Gifts Farm**<br>Amherst, MA | **Flat Rock Farm**<br>Chesterfield, MA |
| **Berniche Family Farm**<br>Chesterfield, MA | **Red Shirt Farm**<br>Lanesborough, MA | **Hunt Road Berry Farm**<br>W. Brookfield, MA |
| **Ledgeline Farm**<br>Goshen, MA | **Stone Bridge Farm**<br>Chesterfield, MA | **Hall Tavern Farm**<br>Shelburne Falls, MA |
| **Winter Rock Farm**<br>Chesterfield, MA | **Handy Lane Farm**<br>Colrain, MA | **Bofat Hill Farm**<br>Chesterfield, MA |
| **Crabapple Farm**<br>Chesterfield, MA | **Dead Branch Farms**<br>Chesterfield, MA | **Crystal Rock Farm**<br>Oakham, MA |
| **Apple Meadow Farm**<br>Ashby, MA | **Morning Dew Farm**<br>Worthington, MA | **Wildberry Acres Farm**<br>Brookfield, MA |
| **Ken Conkey Logging**<br>Belchertown, MA | **Dylan Field Logging**<br>Northfield, MA | **Wood Energy Recyclers**<br>Princeton, MA |
| **Wagner Wood**<br>Amherst, MA | **Hardwick Kilns**<br>Hardwick, MA | **Renewable Heating Solutions**<br>Chesterfield, MA |
| **Quercus Consulting**<br>West Haven, MA | **Strate Landscaping**<br>Williamsburg, MA | **Massachusetts Energy Systems**<br>N. Oxford, MA |
| **Berkshire Ed. & Correction Svcs**<br>Pittsfield, MA | **Farm Family Insurance**<br>Great Barrington, MA | |
| **Northern Forest Center**<br>Concord, NH | **Forest Resources Association**<br>Washington, DC | **Biomass Thermal Energy Council**<br>Washington, DC |
| **Maine Energy Systems**<br>Bethel, ME | **Alliance for Green Heat**<br>Takoma Park, MD | **Lignetics**<br>Louisville, CO |
| **Pellet Fuels Institute**<br>Seattle, WA | **Maine Pellet Fuels Association**<br>Portland, ME | **Lyme Green Heat**<br>Lyme, NH |

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|---|---|---|
| **Froling Energy**<br>Keene, NH | **Tarm Biomass**<br>Orford, NH | **Wisewood Energy**<br>Portland, OR |
| **Connecticut Mulch**<br>Enfield, CT | **Vermont Plank Flooring**<br>Brattleboro, VT | **Long View Forest**<br>Westminster, VT |
| **Kennebec Lumber**<br>Solon, ME | **Professional Logging Contractors of the Northeast**<br>Augusta, ME | **Curran Renewable Energy**<br>Massena, NY |
| **Barefoot Pellet Co.**<br>Troy, NY | **Supreme Forest Products**<br>Southington, CT | **Terry Tree Service**<br>Henrietta, NY |

December 20, 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: Framework for Including Local Air Quality Impacts in Evaluation of Covered Solutions and Obligated Entities**

Dear Commissioner Heiple,

We appreciate the efforts made by Massachusetts Department of Environmental Protection (MassDEP) to develop a Clean Heat Standard (CHS) and to seek stakeholder input to help shape the development of it.

Greater Boston Physicians for Social Responsibility (GBPSR) is a physician-led group of health professionals and community members working to address two of the existential threats to human health: nuclear war and climate change. We appreciate the opportunity to comment on the CHS. Our members include nationally recognized experts in public health, cancer epidemiology, occupational medicine, environmental health, emergency medicine, disaster preparedness, and the health effects of climate change. We offer state-of-the-science and up-to-date medical and public health information about the effects of fossil fuels on human health and the climate crisis.

We support Massachusetts Department of Environmental Protection (DEP) decision to include local air quality as one part of the three criteria for evaluating eligible solutions under the CHS. There is an opportunity to develop a framework for incorporating air quality into decision-making. Our comments will focus on how air quality should be considered when evaluating covered solutions.

Air pollution from criteria pollutants has a direct impact on health and should be evaluated when considering eligibility for covered solutions and how many credits they will receive. The costs of the health impacts from air pollution are significant, which means that the residents of Massachusetts pay twice for supporting combustion fuels including biodiesel, renewable propane, and propane: once to subsidize them through the clean heat standard, *if they are allowed in some respects to be credited*, and once again in the health costs. The adverse health effects of air pollution include asthma, stroke, heart attack and cancer, which translate to lost work caring for sick loved ones and high medical bills, particularly in environmental justice communities. Additional costs are incurred with taxpayer supported insurance programs like Medicaid. For these reasons, we recommend that combustion fuels like biodiesel, renewable propane, propane, renewable natural gas, and hydrogen be excluded from the clean heat standard. This decision should be final and not be open for review in 2028.

**Combustion fuels burned in building appliances emit significant amounts of criteria pollutants**

The byproducts of burning carbon-based fuels, whether fossil fuels or biofuels, include nitrogen oxides, particulate matter, carbon monoxide, and sulfur dioxide. While we could not find emission factors for criteria air pollutants for biofuels, we anticipate that the air pollution rates would be similar to the fossil fuels that the biofuel is replacing.

The Northeast States for Coordinated Air Use Management (NESCAUM) and the Ozone Transport Commission (OTC) provide a table (Table 4) of emissions factors for commonly used fossil fuels for heating in their report, *Residential Building Electrification in the Northeast and Mid-Atlantic: Criteria Pollutant and Greenhouse Gas Reduction Potential* (2003).[1]

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[1] NESCAUM and OTC. *Residential Building Electrification in the Northeast and Mid-Atlantic: Criteria Pollutant and Greenhouse Gas Reduction Potential.* August, 2003.

Table 4: Emission Factors for Fuel Oil, Natural Gas, and Propane Furnaces

| Pollutant | Fuel Oil Combustion | Natural Gas Combustion | Propane Combustion |
|---|---|---|---|
| $CO_2$ | 22,300 pounds (lbs)/1,000 gal | 120,000 lbs/mmcf | 14,300 lbs/1,000 gal |
| $NO_X$ | 0.10815 lbs/MMBtu | 94 lbs/mmcf | 15 lbs/1,000 gal |
| $SO_2$ | 0.213 lbs/1,000 gal | 0.6 lbs/mmcf | 0.0486 lbs/1,000 gal[48] |
| PM | 0.4 lbs/1,000 gal | 7.6 lbs/mmcf | EF not available |

NESCAUM reports that most (83%) of residential building NOx is from natural gas, fuel oil, and propane combustion for space heating, while 13% is attributed to combustion associated with water heating.[2] These byproducts are vented directly outdoors into neighborhoods when burned for space and water heating, contributing to significant amounts of ambient air pollution in Massachusetts.[3] In Massachusetts, buildings produce more NOx than electric generation.[4] NESCAUM estimates that replacing combustion *space heating appliances only* with heat pumps would reduce NOx in Massachusetts by 9,555 tons under the current grid and PM by 314 tons.[5] Should whole home electrification be pursued, those numbers would increase to 11,350 tons 430 tons under the current grid. We support the phase out of all fossil fuel home water and heating equipment and recommend heat pump water heaters and electric stoves and dryers be included in the covered solutions. We would like to see the DEP do all it can to promote early adoption of zero emission equipment standards.

**Criteria air pollutants harm health**

Air pollution, in general, affects lung, cardiovascular, and prenatal health as well as child development.[6] NOx contributes to the formation of secondary fine particulate matter ($PM_{2.5}$) and ozone; it is known to exacerbate asthma symptoms and according to the EPA is "likely causal" of new asthma cases.[7] $PM_{2.5}$ exposure is associated with a variety of health effects, including reduced lung function, COPD, irregular heartbeat, asthma

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https://otcair.org/upload/Documents/Reports/Residential%20Building%20Electrification%20Final%20Report%20August%202023.pdf Last accessed 12-16-23

[2] NESCAUM and OTC. *Residential Building Electrification in the Northeast and Mid-Atlantic: Criteria Pollutant and Greenhouse Gas Reduction Potential.* August, 2003. https://otcair.org/upload/Documents/Reports/Residential%20Building%20Electrification%20Final%20Report%20August%202023.pdf Last accessed 12-16-23

[3] Dedoussi et al., Nature Feb 2020 (MIT study- supplemental material).

[4] https://www.epa.gov/air-emissions-inventories/2020-nei-supporting-data-and-summaries

[5] NESCAUM and OTC. *Residential Building Electrification in the Northeast and Mid-Atlantic: Criteria Pollutant and Greenhouse Gas Reduction Potential.* August, 2003. https://otcair.org/upload/Documents/Reports/Residential%20Building%20Electrification%20Final%20Report%20August%202023.pdf Last accessed 12-16-23

[6] Boston College. MassCleanAir. 2022. https://www.bc.edu/bc-web/centers/schiller-institute/sites/masscleanair.html Last accessed 12-16-23

[7] U.S. EPA. Integrated Science Assessment (ISA) for Oxides of Nitrogen – Health Criteria (Final Report, Jan 2016). U.S. Environmental Protection Agency, Washington, DC, EPA/600/R-15/068, 2016. https://assessments.epa.gov/isa/document/&deid=310879 Last accessed 12-16-23

attacks, heart attacks, stroke and premature death in people with heart or lung disease.[8] In infants and children, $PM_{2.5}$ increases the risk for premature birth, low birthweight, stillbirth, asthma, impaired lung development, and adverse neurodevelopmental outcomes. It poses a heightened risk for the most vulnerable people in Massachusetts, especially children and the elderly.

**Criteria air pollutants harm health below national ambient air quality standards**
While Massachusetts is currently compliant with current national ambient air quality standards, that does not mean that the current levels of pollution are not harming health. A recent study found that for every increase of 10 μg/m$^3$ in $PM_{2.5}$, there is an associated 7.3% increase in all-cause mortality. Moreover, the slope of the relationship between $PM_{2.5}$ and mortality was greater at $PM_{2.5}$ levels below 12 μg/m, and$^3$, there was no level below which $PM_{2.5}$ was safe.[9] [10] A more recent analysis showed significant reductions in mortality associated with $PM_{2.5}$ concentrations of 8 μg/m$^3$ versus 12 μg/m$^3$, with more marked reductions in Black and low income populations.[11]

The current science finds that EPA particulate matter and $NO_2$ standards do not adequately protect health. The World Health Organization (WHO) revised its particulate matter air quality guidelines in 2021[12]; WHO recommended that annual particulate matter levels be 5 μg/m$^3$ and daily levels be limited to 15 μg/m$^3$. In comparison, the EPA standard is nearly twice that: an annual $PM_{2.5}$ standard in the range of 9.0 to 10.0 μg/m$^3$ and a daily standard of 35 μg/m$^3$, though we are awaiting EPA's decision on whether to lower the $PM_{2.5}$ standard. The Massachusetts Medical Society has advocated for lower $PM_{2.5}$ standards because of these health impacts. WHO recommendations for health standards for $NO_2$ are lower than the EPA as well: in 2021 the WHO cut its recommendation for the annual average limit of $NO_2$ by 75% from 40 to 10 μg/m3 (5 ppb)[13] which is about ten times lower than the EPA's 53 ppb annual average.

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[8] U.S. EPA. Supplement to the 2019 Integrated Science Assessment for Particulate Matter (Final Report, 2022). U.S. Environmental Protection Agency, Washington, DC, EPA/635/R-22/028, 2022.
[9] Di Q, Wang Y, Zanobetti A, et al. Air pollution and mortality in the Medicare population. N Engl J Med 2017;376:2513-2522
[10] Berger et al. Air pollution still kills. N Engl J Med 2017; 376:2591-2592
[11] Josey et al. Air Pollution and Mortality at the Intersection of Race and Social Class. N Engl J Med 2023; 388:1396-1404
[12] World Health Organization (WHO). *WHO Air Quality Guidelines: Particulate matter (PM2.5 and PM10), ozone, nitrogen dioxide, sulfur dioxide and carbon monoxide,* 2021. https://apps.who.int/iris/bitstream/handle/10665/345329/9789240034228-eng.pdf?sequence=1&isAllowed=y Accessed 12-16-2023
[13] World Health Organization (WHO). *WHO Air Quality Guidelines: Particulate matter (PM2.5 and PM10), ozone, nitrogen dioxide, sulfur dioxide and carbon monoxide,* 2021. https://apps.who.int/iris/bitstream/handle/10665/345329/9789240034228-eng.pdf?sequence=1&isAllowed=y Accessed 12-16-2023

Policymakers have historically undervalued the importance of clean air. But dirty air in Massachusetts from all sources has caused over 2700 premature deaths and an estimated 308 babies to be born with a low birth weight. Over 15,386 cases of pediatric asthma are attributable to ambient air pollution, and a loss of almost 2 million performance IQ points, or just over two IQ points for the average child. This loss of IQ is associated with poorer school performance and lower graduation rates.[14]

By allowing biofuels like biodiesel and renewable propane to be a covered solution and eligible for clean heat credits, Massachusetts will be subsidizing air pollution that causes poor health, low birth weight babies, premature death, poor school performance, missed workdays, missed school days, and decreased graduation rates.

**Combustion cooking appliances degrade indoor air quality**

Cooking with gas stoves contributes to indoor air pollution, including pollutants like nitrogen dioxide, carbon monoxide and benzene. Multiple studies have found that pollution from gas cooking appliances often exceeds EPA outdoor standards for $NO_2$.[15] [16] [17] The EPA recommends that ventilation be used in conjunction with gas stoves, but a recent study from the National Center for Healthy Housing found ninety percent of rental homes tested had inadequate mechanical venting to remove indoor air pollution from gas stoves.[18]

Children living in homes with gas cooking stoves have a 42% higher risk of current asthma.[19] A longitudinal study in Massachusetts demonstrated that children with asthma who lived in homes with gas cooking stoves had more severe and frequent asthma symptoms.[20] More than 40% of households in Massachusetts cook with gas stoves, and 15% of pediatric asthma cases in the Commonwealth have been attributed to the use of these stoves.[21]

Gas stoves also emit unhealthy concentrations of CO. The WHO 8-hour limit is 8.7 ppm and 24-hour is 3.5 ppm. The EPA 8-hour CO ambient air quality standard is 9 ppm. The Lawrence Berkeley National Laboratory estimates that 7-8% of households with gas

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[14] https://www.bc.edu/bc-web/bcnews/science-tech-and-health/earth-environment-and-sustainability/massachusetts-air-pollution-deadly-toll.html
[15] https://pubmed.ncbi.nlm.nih.gov/24192135/
[16] https://onlinelibrary.wiley.com/doi/am-pdf/10.1111/ina.12190
[17] https://pubmed.ncbi.nlm.nih.gov/9949739/
[18] The National Center for Healthy Housing. Studying the Optimal Ventilation for Environmental Indoor Air Quality. April 2022. https://nchh.org/resource-library/report_studying-the-optimal-ventilation-for-environmental-indoor-air-quality.pdf Accessed 12-16-23
[19] https://pubmed.ncbi.nlm.nih.gov/23962958/
[20] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3686297/
[21] https://www.mdpi.com/1660-4601/20/1/75

cooking appliances in California exceed CO ambient air quality standards in the winter.[22] There are no specific estimates for Massachusetts, but the Environmental Protection Agency (EPA) compared homes with and without gas cooking appliances and reported average levels of carbon monoxide (CO) in homes without gas appliances were 0.5 to 5.0 parts per million (ppm), while concentrations in homes with gas cooking appliances ranged from 5 to15 ppm, while homes with poorly adjusted gas ranges contributed to CO concentrations 30 ppm or higher.[23]

There is new evidence that gas cooking appliances can leak benzene even when the appliances are turned off, and that benzene is present in unburned and combusted methane.[24] [25] Benzene is one of 120 known human carcinogens[26] and there is widespread appreciation in the medical community that there is no safe level of exposure.[27]

**Reducing air pollution by small amounts leads to improved health**
Improving local air quality by small amounts has been shown to reduce pediatric asthma rates. In an longitudinal cohort study that included more than 4000 healthy children an annual median $NO_2$ reduction of just 4.3 parts per billion (ppb) was associated with a decline in the pediatric asthma incidence rate by 0.83 cases per 100 person-years; a median reduction of 8.1 µg/m3 of $PM_{2.5}$ was associated with 1.53 fewer incident cases per 100 person-years; and a median reduction in ozone of 8.9 ppb was associated with 0.78 fewer incident cases per 100 person-years.[28] Reducing air pollution is also associated with improved school performance, and fewer missed school days.[29] The Commission on pollution and health analysis found that improving air quality is highly cost-effective, yielding an estimated return of $30 for every dollar invested.[30]

[22] https://ehp.niehs.nih.gov/doi/10.1289/ehp.1306673
[23] U.S. EPA. Carbon Monoxide's Impact on Indoor Air Quality https://www.epa.gov/indoor-air-quality-iaq/carbon-monoxides-impact-indoor-air-quality#Sources Accessed 12-16-23
[24] https://pubs.acs.org/doi/10.1021/acs.est.1c04707
[25] https://pubs.acs.org/doi/10.1021/acs.est.1c08298
[26]https://canceratlas.cancer.org/risk-factors/human-carcinogens/#:~:text=Image%20of%20human%20body%20anatomy,agents%20as%20carcinogenic%20to%20humans.
[27] https://www.who.int/publications/i/item/WHO-CED-PHE-EPE-19.4.2
[28] Garcia E, Berhane KT, Islam T, et al. Association of changes in air quality with incident asthma in children in California, 1993–2014. JAMA. 2019;321(19):1906–1915.
[29]https://www.boston.com/news/environment/2022/07/18/massachusetts-thousands-deaths-air-pollution-boston-college-study/
[30] https://www.epa.gov/sites/default/files/2015-07/documents/factsheet.pdf

**Reducing air pollution improves health equity**

Black, Indigenous, and People of Color (BIPOC) are exposed to more particulate pollution from almost every source, including residential pollution sources.[31] As expected from exposure studies, air-pollution-related illnesses like pediatric asthma disproportionately affect Black and Latino children. Pediatric asthma is one of the most common childhood illnesses, and rates of pediatric asthma in Massachusetts are higher than national rates. About one in eight school aged children has an asthma diagnosis in Massachusetts; those rates increase to 1 in 6 children for communities like Springfield and Boston, disproportionately affecting Black and Latino students.[32] By improving air quality, improvements in health equity would be expected, lowering the high costs of air pollution related illnesses borne by Black, Indigenous, and People of Color (BIPOC) communities.[33]

**Recommendations for including local air quality in the Clean Heat Standard**

1. We recommend the simplest solution for considering ambient and indoor air pollution for covered solutions: exclude **all** combustion fuels, including biodiesel, renewable propane, and propane, from the covered solutions. This recommendation includes hydrogen and RNG which are slated to be reevaluated in 2028. Combustion fuels degrade local ambient air quality, which has significant and costly health effects for every age group, and disproportionately affects BIPOC communities. These costs are incurred by the residents of Massachusetts who pay for the illnesses and poor health that air pollution inevitably causes.

2. In the event the DEP retains combustion fuels in the Clean Heat Standard, we recommend DEP account for impacts on local air quality. We suggest using the emission factors for fuels to develop a formula for subtracting partial credits for covered solutions that contribute to local air pollution. For example, a partial credit subtraction should be applied for fossil fuel infrastructure left in place for backup heat. Further, biodiesel, renewable propane, or propane should have partial credit subtractions for the pollution they emit. On top of the initial subtraction, an additional credit subtraction should be made for covered solutions that will inevitably further pollute environmental justice (EJ) communities (as

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[31] 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.

[32] https://www.mass.gov/info-details/pediatric-asthma-data

[33] Note: The annual per-person medical cost of asthma was $3266, of which: $1830 was for prescriptions $640 for office visits $529 for hospitalizations $176 for hospital outpatient visits $105 for emergency department (ED) care. https://www.ajmc.com/view/cdc-study-puts-economic-burden-of-asthma-at-more-than-80-billion-per-year

defined by the Commonwealth).[34] Since pollution does not stay in one community, we suggest that an additional subtraction be added to all combustion covered solutions to account for their impact on EJ communities. The amount of air quality credit reductions should be based on emissions and their disproportionate effect on EJ communities.

**Examples:**

**Scenario 1:** A heat pump is installed in a home. The natural gas furnace is left in place as backup heat and the installers are credited ½ credit. Accounting for the air pollution, a 1/8 credit is subtracted for the natural gas backup heat and an additional 1/8 credit is subtracted for polluting EJ communities.

**Scenario 2:** Biodiesel is used to replace oil in a boiler. A 1/4 credit is subtracted for air pollution and another 1/4 credit is subtracted for impacts incurred in EJ communities.

3. We recommend the clean heat standard expand beyond space heating to include hot water heaters, dryers and cooking appliances. These appliances account for about 15% of ambient air pollution from buildings[35] and gas cooking appliances, when used without ventilation, often exceed ambient $NO_2$ standards indoors. Moreover, leaving polluting gas appliances in buildings only extends the reliance on the leaky natural gas distribution infrastructure used to supply them.

4. We urge DEP to exclude electricity suppliers and distributors from being obligated entities. In the Northeast, electricity is more expensive than natural gas. Putting additional responsibilities on electricity suppliers only adds to the expense and will likely have the unintended consequence of slowing electric appliance adoption and leaving polluting appliances in place. If electricity providers are going to be obligated entities, to simplify the administration of the program, the obligation ought to be on the electric distribution companies, not the suppliers.

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[34] https://www.mass.gov/info-details/environmental-justice-populations-in-massachusetts
[35] NESCAUM and OTC. *Residential Building Electrification in the Northeast and Mid-Atlantic: Criteria Pollutant and Greenhouse Gas Reduction Potential.* August, 2003. https://otcair.org/upload/Documents/Reports/Residential%20Building%20Electrification%20Final%20Report%20August%202023.pdf Last accessed 12-16-23

**Conclusions**
Combustion fuels degrade indoor and ambient air quality and harm health at low concentrations, well below current EPA ambient air quality standards, and yet these costs have not yet been considered in the CHS. The Clean Heat Commission was mindful of the health impacts of air pollution and recommended it be accounted for in cost-benefit calculations. The health benefits and cost savings of air quality improvements should be considered for covered solutions. When the costs of air pollution are factored into the analysis of eligible solutions, it's clear that combustion fuels should not be included in the CHS.

Sincerely,

Andee Krasner, MPH
Program Manager, Climate and Health,
Greater Boston Physicians for Social Responsibility

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December 21, 2023

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

RE: Clean Heat Standard (CHS) Draft Framework

Dear Commissioner Heiple:

I am writing to you on behalf of the Greater Lawrence Sanitary District (GLSD) regarding MassDEP's Clean Heat Standard (CHS) Draft Framework.

GLSD is a regional wastewater treatment facility located in North Andover with a service area including the cities of Lawrence and Methuen and the towns of North Andover, Andover, and Dracut, Massachusetts.

GLSD supports the use of biosolids for an array of end uses, including for renewable energy. Our Organics to Energy Process commenced operation in 2019. It uses biogas produced during the anaerobic digestion process of food waste and municipal biosolids to produce electricity and heat for onsite needs as well as net metering of power to our offsite wastewater pumping station. This project was financially supported by MassDEP, DOER, CEC, MA Clean Water Trust, and National Grid. This project <u>reduces GLSD's GHG emissions by 20%</u> (provided by DOER) and is equivalent to <u>taking over 1000 cars off the road</u>. We also utilize a process that has a smaller carbon footprint than composting, landfilling or incineration.

GLSD wants to express its concerns with the draft CHS framework and its exclusion of renewable natural gas (RNG) as a clean heat measure under the program design. The MassDEP's 2030 Solid Waste Master Plan, issued in October 2021, touts the benefits of anaerobic digestion (AD) as a means of diverting waste and creating new market and business opportunities in the Commonwealth. We appreciate that MassDEP values the role of AD and has chosen to make significant investments through grant opportunities to expand the use of these systems and to expand the market for their adoption. Given this level of commitment to AD in the past and at GLSD, we were disappointed to see MassDEP overlook RNG under the draft CHS framework.

Although GLSD does not currently produce RNG for injection into pipelines that could provide clean heat for Massachusetts families and businesses, we believe one of most impactful policies to incentivize AD would be to include RNG as an eligible technology under the CHS. Locally produced RNG could be delivered over the existing utility gas network to customers with hard to reach electrification needs.

Including RNG in the CHS would complement the Solid Waste Master Plan by creating an economic driver for increased AD and much-needed outlets for biosolids. The Commonwealth generates approximately 2,475 wet tons of biosolids every day, the equivalent of 88 tanker truck loads that need to be managed. Using AD technology to manage these materials produces clean energy, reducing greenhouse gas emissions. This is a win-win for the waste sector and for the energy sector. We therefore encourage MassDEP to reconsider the role of RNG in the CHS program design to ensure the Commonwealth's priorities are consistent and result in the greatest possible support for expanding AD and reducing greenhouse gases while generating RNG.

GLSD appreciates MassDEP's efforts to make the Commonwealth's waste and energy systems more sustainable and its ongoing support of our Organics to Energy process. We urge you to include RNG as an eligible clean heat technology to support our shared goals for a better future for all.

Sincerely,

Cheri Cousens

Cheri R. Cousens, P.E.
Executive Director

**Parnay, Angela L (DEP)**

| | |
|---|---|
| **From:** | Rob Hislop <loon23@gmail.com> |
| **Sent:** | Monday, January 8, 2024 11:28 AM |
| **To:** | Strategies, Climate (DEP) |
| **Subject:** | Propane |



Please let My lawmakers know we are not in favor of eliminating propane fuel from our homes.It's a clean burning fuel and important for our daily lives. Rob

# Parnay, Angela L (DEP)

**From:** Larry Horowitz <callingllh@verizon.net>
**Sent:** Monday, December 18, 2023 1:41 PM
**To:** Strategies, Climate (DEP); Larry Horowitz
**Subject:** Planned MA actions on natural gas



Hi!
We are misallocating our efforts. Ice sheet scientists are in published agreement that the Antarctic ice sheet will be melting, whether we restrict carbon emissions or not. Instead of increasing costs by forcing the use of green energy sources over fossil fuels, we should be spending more money on researching climate change mitigation, like sea walls, etc.
Thanks,
Larry Horowitz

December 21, 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: Covered Solutions in the Clean Heat Standard

Dear Commissioner Heiple,

Please accept these comments from the Hydrogen and Biomethane Working Group of the Gas Transition Allies (GTA). GTA 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. We appreciate the ongoing efforts made by Massachusetts Department of Environmental Protection (MassDEP) to develop a Clean Heat Standard and the opportunity to offer input.

In light of the recent Department of Public Utilities Order in the 20-80 proceeding rejecting the blending of hydrogen and RNG in fossil gas[1] and hybrid heating schemes[2] relying on combustible fuels as viable decarbonization methods in favor of full electrification as the Commonwealth's dominant strategy to meet emission reduction mandates, we would like to renew our call that the clean heat standard (CHS) 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 liquid and gaseous biofuels. Hydrogen and biofuels (including but not limited to renewable natural gas, renewable heating oil and renewable propane) are polluting, dangerous, inefficient, more expensive, 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

[1] Massachusetts Department of Public Utilities, Docket 20-80, ORDER ON REGULATORY PRINCIPLES AND FRAMEWORK at 1 "*The Department rejects the recommendation to change its current gas supply procurement policy to support the addition of renewable natural gas ("RNG") to LDC supply portfolios due to concerns regarding the costs and availability of RNG as well as its uncertain status as zero-emissions fuel.*" available at: https://fileservice.eea.comacloud.net/FileService.Api/file/FileRoom/18297602

[2] Id at 55 "*the Department is not persuaded that pursuit of a broad hybrid heating strategy that would necessitate maintenance of the natural gas system to support backup heating systems is a viable path forward.*"

reducing exposure to air pollutants are factored into decision-making and incorporated into cost-benefit calculations across all major decarbonization programs."

Additionally, we call on the DEP to exclude incentivizing combustible fuels in the CHS and to forego the idea of reviewing their inclusion in the next round in 2028. The Commonwealth should just move on from combusting fuels for building heating.

**Combustion fuels Maintain Health Inequities**

Natural gas and renewable natural gas made from biofuels are composed predominantly of methane. Renewable propane, when burned, has similar byproducts to propane.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.[3] Propane and natural gas burned in gas stoves also contribute to indoor air pollution through unvented gas cooking. A recent analysis found that 15% of pediatric asthma cases are attributable to indoor air pollution from gas stoves.[4] .

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.[5] While burning hydrogen in end-use appliances may not release carbon dioxide, it does still produce air pollution in the form of nitrogen oxides ($NO_x$).[6,7] 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

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[3] Dedoussi et al., Nature Feb 2020 (MIT study- supplemental material).

[4] https://www.mdpi.com/1660-4601/20/1/75

[5] US Environmental Protection Agency (EPA).National Emissions Inventory. 2014. https://edap.epa.gov/public/extensions/nei_report_2014/dashboard.html#trend-db

[6] 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.

[7] 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.[8] [9] Air pollution from burning fossil fuels contributes to 7600 premature deaths in Massachusetts a year.[10]

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[11] and particulate matter from burning fossil fuels than white people,[12] 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.

We urge the DEP not to succumb to the ever present lobbyist claims that various biofuels can play a role in our Commonwealth meeting its emission reduction mandates.

## Conclusions

There is no reason to revisit and review the exclusion of hydrogen and RNG in 2028. Those energy sources will be just as polluting in the future as they are now. We recommend that MassDEP exclude all combustion fuels because they are more polluting and more dangerous than their electric counterparts. 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, it makes no sense for the Commonwealth to promote combustion fuels like biodiesel and renewable propane in the CHS. Healthier and safer options for heating homes are already available. We urge you to exclude combustion fuels from covered solutions in the CHS.

Respectfully submitted,

Cathy Kristofferson on behalf of the Hydrogen and Biomethane Working Group of Gas Transition Allies

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[8] Guarnieri M, Balmes JR. Outdoor air pollution and asthma. Lancet. 2014;383(9928):1581-92. https://www.sciencedirect.com/science/article/abs/pii/S0140673614606176

[9] 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.

[10] https://www.bostonglobe.com/2021/02/09/metro/burning-fossil-fuels-kills-an-estimated-350000-people-year-study-finds

[11] 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

[12] 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

**Parnay, Angela L (DEP)**

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**From:** Karen Lapham <zoeysuegirl44@gmail.com>
**Sent:** Thursday, December 21, 2023 1:35 AM
**To:** Strategies, Climate (DEP)



It's rediculas to think that folks should not have options to keep their homes warm.
None of the options put out there help every family budget
Many are struggling with rent & out of control, food.
So let's add to the REAL
problems of citizens...
Stop jamming so much down folks..
Thank you.
Karen Lapham

67 Main St Carver ma

LIGNETICS GROUP
EXPANDING SUSTAINABLE POSSIBILITIES

11101 W. 120th Ave., Suite 200
Broomfield, CO 80021
www.Lignetics.com
O 800-544-3834

December 19, 2023

Department of Environmental Protection
100 Cambridge St., Suite 900
Boston, MA 02114

Dear Mass DEP:

Lignetics is the largest producer of wood pellets for domestic home heating in North America. We are proud of being able to offer a low-cost, low carbon, domestically sourced heating option. The current draft of the Clean Heat Standard has a number of limitations and omissions with respect to accomplishing the goals set forth in the 2025/2030 Clean Energy and Climate Plan. We are co-signatories of the letter submitted by the Good Wood Coalition headed by Chris Egan. The data and explanation provided by Mr. Egan is thorough and well-researched. We will not reiterate the points he makes, though we agree with them entirely. Being intimately aware of the origin of the feedstock for our heating pellets and how the industry operates generally, we did want to share some facts. We feel compelled to do so since the inclusion of liquid biofuels, while solid biomass is omitted, expresses a gap in familiarity with the 'sameness' of much of the feedstock going into both fuel types.

Lignetics has four manufacturing locations that serve Massachusetts: Deposit, NY; Schuyler, NY, Jaffrey, NH; and Strong, ME. Combined these plants will have produced over 250,000 tons of heating pellets in 2023. While an exact breakdown of pellets used in MA is not in our data, we do know that we are the largest contributor to the market. The entirety of the feedstock used in these plants, and the other 22 plants that we own and operate, is either sawmill/wood product manufacturing residues (sawdust/shavings) or non-merchantable forest residuals (smaller branches converted to chips). The ratio of these two types is 60/40, sawdust/chips. We maintain rigorous records of the origin of the material that we procure. Economically, the use of residuals is essential to the viability of the wood pellet industry, as more valuable, merchantable wood is simply too expensive. This material is identical to much of the feedstock being used in liquid biofuels production and should be afforded the same designation with respect to its carbon impact. I realize this information is introductory and that you may have follow-up questions. We very much welcome an invitation to collaborate to assist in shaping a Clean Heat Standard that accurately captures the full range of effective technologies available.

Sincerely,

Frank Kvietok, Ph.D.
Senior Director of Innovation, Lignetics Group

January 2024

Department of Environmental Protection
100 Cambridge Steet,
Boston, MA 02114

Re: Massachusetts Clean Heat Standard - Draft Framework Comments
Sent via email: climate.strategies@mass.gov

Thank you for the opportunity to comment on the CHS draft framework. Our company, Lin's Propane Trucks, is a family-owned small business that manufactures propane delivery trucks located in Dighton, Massachusetts. We have 32 employees that live in our town and surrounding communities. We have been in business in this community for 39 years and we are a large supporter of our local food bank as well as numerous other community organizations, activities and charities.

We are concerned that MA DEP is making a mistake by not incentivizing the usage of propane in the Commonwealth. Prioritizing electric heat pumps over cleaner propane systems will increase emissions in our state. We urge DEP to consider providing credits for geologic propane and treating it in the same manner as MA classifies renewable biomass. Propane is a beneficial by-product of natural gas processing and if it is not used it is wasted. As a waste product, it should be incentivized not only so that it will lower GHG emissions in MA, but also so that it will be available as a reliable affordable energy source for energy security during times or emergencies.

Today, geologic propane in MA has a carbon intensity of 77 which is less than the carbon intensity of electricity and heat pumps in MA which is 100 – 140 depending on how cold the winter is each year. Even if MA electricity becomes cleaner, it still makes no sense to disincentivize propane systems as the propane industry will continue to lower its carbon intensity with the addition of renewable propane blends. Our industry has a clean product, but we are not satisfied, and our goal in MA is to always have a lower carbon intensity than MA electricity and heat pumps. Thus, if MA DEP Is indeed trying to reduce carbon emissions today with a CHS, propane should simply be awarded clean heat credits.

The delivery of renewable propane and renewable propane blends should generate clean heat credits in all circumstances. Renewable propane should be explicitly designated as a qualifying biofuel. In order to incentivize innovation and increase the displacement of non-renewable thermal fuels, the definition of renewable fuels should be broadly defined and not narrowly tailored. Renewable propane is a by-product of renewable diesel production and can be derived from a variety of sustainable sources, such as biomass, animal fats, and vegetable oils.3 At the point of combustion, renewable propane is carbon neutral because it's not releasing new carbon into the atmosphere. Renewable propane currently being used in California has a CI score as low as 21.4. This renewable propane is produced from non-rendered, used domestic cooking oil.

Finally, renewable propane should be incentivized in MA by DEP taking the lead to promote renewable propane development in the state. DEP could be leading the way and setting an example of how to reduce emissions while maintaining an equitable solution to energy security. MA must have backup energy for electricity outages and extreme weather events. Propane fills this role today as the backup fuel for generators across our state, and its use should be increased in the state to make sure we have environmental equity and affordability. MA must be conscious of the huge environmental impact of batteries and heavy metals. MA must not incentivize battery storage because doing so would be detrimental to the most vulnerable environmental justice populations on earth. We must not create more child labor and strip mining in the Republic of Congo and other developing countries. We have a clean solution in propane at our fingertips supported by local businesses like my own already in place that we should be incentivizing to make sure that we have a clean solution to energy security needs in our state.
Respectfully submitted,

**Scott Swensen**
**Sales Manager**
**Lin's Propane Trucks**
**2281 Cedar Street**
**Dighton, MA 02715**

## Parnay, Angela L (DEP)

**From:** Foley, Kevin <Kevin.Foley@tuftsmedicine.org>
**Sent:** Monday, December 18, 2023 7:27 PM
**To:** Strategies, Climate (DEP)
**Subject:** Comments on proposed Clean Heat Standards



Hello Commissioners,

Being a community hospital that serves patients 24/7/365 we need the ability to provide **reliable electric, heating and cooling utilities** to the campuses and the CHS's timeline is impossible to meet given the current availability of renewable energy in Massachusetts and New England, along with the infrastructure to transport clean energy that is also decades and billions (if not trillions) of dollars away.

In following the current ESMP process that does not address where 30,000 MW's of new MA renewable energy will come from, the fact that none of this is in the ISONE Queue, and the actual results of the earlier 83D process that has yet to be built and where the developer is now seeking $500,000,000 outside of the competitive bidding process there is no assurance that MA can build the electrification supply quick enough to meet the CHS goals or even at a reasonable price that consumers like us can afford.

The MA ESMP process appears to not even consider that ISONE will probably lose nearly 5,000 MWs of 24/7/365 reliable power to retirements between now and 2050, and the ESMP and CHS programs also do not consider that consumers cannot even purchase enough solar, community solar or wind today as developers are significantly dropping projects – including projects that were subscribed for!

There is no doubt that the transition to electrification will take decades and there needs to be an acknowledgment in the CHS that Natural Gas will still be available through this transition, and most likely there will always be a dual fuel heating need that Canada is already adopting after realizing that they do not enough electricity to go around in winter. In fact New England narrowly averted blackouts on December 24, 2022 and February 4, 2023 when Canada's supply commitment dropped (to zero on 2/4/2023) and it was only by the ability of the NYISO to pick-up the load and save the day, but given NY's goals to also shutdown reliable power means there is no guarantee this will be an available resource going forward.

MA hospitals have fairly steady summer and winter heating loads and are ideal Distributed Energy Resources "DERs" and the CHS (and Mass Save) should promote **reliable, resilient and highly efficient** Natural Gas and Propane Fueled Boilers, Combined Heat and Power Plants and Fuel Cell Plants that offer real and significant carbon reducing technologies today with construction guaranteed in months, instead of waiting decades for electrification – especially as we are exposed to an ever decreasingly reliable electric grid.

The failure to build out renewable energy sources and infrastructure ahead of the current CHS timelines will only lead to pricing competition where non-profits such as hospitals will not be able to compete for high-priced scare clean energy products – yet we may end up paying the same price or more in penalties (fees, surcharges, taxes…) with no environmental benefits, OR alternately end up paying for these high priced products with costs passing through to consumers that can least afford to pay.

CHS is a great goal but the timing needs to be delayed and the roll-out process changed to be milestone driven to match the Renewable Energy Source and Infrastructure build out.

I am glad to discuss any of this further,

Kevin Foley
Lowell General Hospital
Director Plant Operations and Property
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December 21, 2023

Bonnie Heiple, Commissioner
Department of Environmental Protection
100 Cambridge St., Suite 900
Boston, MA 02114

RE: MassDEP Clean Heat Standard (CHS) Draft Framework For Stakeholder Comment (November 2023 )

Dear Commissioner Heiple:

This is the Comment of the Low-Income Weatherization and Fuel Assistance Program Network and its leadership, the Low-Income Energy Affordability Network (LEAN) (collectively, The Low-Income Network), regarding the proposed low-income carveout in the MassDEP Clean Heat Standard (CHS) Draft Framework For Stakeholder Comment (November 2023). It is focused on delivery of air source heat pumps (ASHPs) by The Low-Income Network to low-income (LI) households through MassSave, the US DOE Weatherization Assistance Program (WAP), and other programs.

The Low-Income Network appreciates this opportunity to comment. The Low-Income Network strongly supports the Commonwealth's greenhouse gas (GHG) reduction policy and is working effectively to achieve it in the low-income sector. The Low-Income Network is accordingly supportive of the DEP target-setting toward that end. Success will depend on policy development, which, as described below, is well underway but not complete. For example, low-income customers who heat with gas would receive significantly increased heating and maintenance bills which they cannot afford if they convert to electric air source heat pumps. For this reason, The Low-Income Network submits that it is premature to set definitive targets in the low-income sector at this time, until the policy framework necessary for success is established. For example, The Low-Income Network looks forward to working with DEP, other state agencies, and the MassSave Program Administrators (PAs) toward that end.

G.L. c. 25, sec. 19(c) (Green Communities Act, St. 2008, c. 169, sec. 11) provides that "The low-income residential demand side management and education programs shall be implemented through the low-income weatherization and fuel assistance program network and shall be coordinated with all electric and gas distribution companies in the commonwealth with the objective of standardizing implementation." The Low-Income Weatherization and Fuel Assistance Program Network is the agencies that implement programs under the Act. The Low-Income

Energy Affordability Network (LEAN) is the organization of lead agencies in the low-income weatherization and fuel assistance program network.

The Low-Income Network has ramped up and reorganized its delivery platform, including doubling of contractor oversight capacity for air source heat pump production in order to meet the Commonwealth's GHG reduction goals, while maintaining strict 100% quality control. The Network is also piloting cost-effective battery storage and introducing additional cost-effective weatherization measures (such as windows where indicated). The Low-Income Network thus stands ready to meet the Commonwealth's vital GHG goals and is already operating at double the heat pump installation rate of last year – the current production rate, including project pipeline, for example, will meet or exceed MassSave three-year targets for year-end 2024 (about 5800, or almost 2000 ASHPs per year over the three-year Term). The vast majority of those installations are full electrification conversions from oil, propane, and electric resistance heating,

The Low-Income Network estimates that there are about 45,000 such low-income oil, propane, and electric resistance heating households remaining to be converted. Nearly all the remaining low-income households are heated by utility gas, for the majority of whom a conversion would represent an unaffordable increase in heating and maintenance bills. The Low-Income Network projects that it will serve all remaining low-income oil, propane, and electric resistance households in about seven years, at the rate of 6000 a year, assuming sufficient MassSave budgets.

DEP proposes annual full electrification heat pump production targets, including a low-income (LI) carve out (including funding from all sources) that includes municipal utilities and other fuels. For electricity, proposed targets apparently begin with the MassSave electric plan until 2027. However, proposed gas production targets (as well as obligations with respect to other fuels) are based on relative $CO_2$ emissions.[1]

The Low-Income Network unwaveringly supports the thrust of DEP LI goals, but there is need for recognition of the public policy support necessary to meet those goals. Much of that policy support is currently under development and thus represents significant current uncertainty, including:

* Consensus over MassSave targets, program eligibility screening (*e.g.,* the value of the Social Cost of Carbon (SCC)), measure mix (*I.e.*, focus on heat pumps, maintenance thereof, and a full menu of weatherization measures), as well as the level of ratepayer-financed budgets. MassSave budgets, measure mix, and targets for the years 2025-2027 and thereafter have not been set.

* MassSave targets that reflect integrated planning of electricity and gas distribution systems, as well as currently unannounced Office of Energy and Environmental Affairs (EEA) emission reduction targets.

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[1] MassDEP Clean Heat Standard (CHS) Draft Framework For Stakeholder Comment Only November 2023 at 2, 3. Accessed at www.mass.gov/doc/chs-draft-program-framework/download.

* Identification of additional MassSave budgets (*e.g.*, from Alternative Compliance Payments) in order to meet production goals without increasing energy burden barriers for all customers, particularly low-income households. For example, the Low-Income Network estimates a total budget requirement of at least $6 Billion to electrify and weatherize the low-income homes not already addressed. Low-income targets set by DEP need to be coordinated with MassSave implementation.

* Statewide cross-sector development efforts to create a sufficient and diverse workforce in support of production goals.

* Since approximately 60% of low-income households heat with gas, agreements on modifications to low-income rate designs, and measure supports, to remove the substantial affordability barrier for low-income households who will need to convert from gas heat to alternatives (principally electric air source heat pumps) while achieving least-cost upgrades, reliability, resilience, and protecting those who cannot safely respond to time-of-use heating restrictions or incentives.

* Addressing multifamily housing barriers. Converting master-metered gas to individually metered electric, where electric heating costs exceed previous rent-included gas heating costs, can result in large and unaffordable increases in total low-income tenant shelter costs. An additional multifamily housing barrier is staff needs for continuing maintenance.

* Assessment of bill impact offsets likely due to increased sales from electrification of housing and vehicles.

* Development of and policy support for cost-effective GHG reduction technologies that can be more cost-effective than currently, *e.g.*, storage; air-to-water air source heat pumps, which would make possible use of existing heat distribution systems rather than installation of new ductwork.

Additionally, DEP clarification about the following points would be helpful:

* Clarity about DEP LI delivery targets by fuel, given that MassSave's low-income programs address electric, gas utility, oil, propane, and electric resistance heating and the Low-Income Network also provides services in municipal utility territories.

* The next MassSave three-year term begins in 2025. The Term goals are effectively three-year goals, thus making a point-estimate 2026 goal, on which the DEP proposal apparently relies, of limited application.

* While the proposed initial LI Electric obligation is based on MassSave three-year plans, the proposed LI Gas obligation is not, although the two programs are largely integrated.

* Further, the proposed determination of the LI Gas obligation requires calculation based on $CO_2$ emissions, though the emission reduction standard is

more appropriately aimed at the greenhouse gas (GHG) emissions targeted by the Commonwealth's policy.[2]

It may be relatively simple to project and allocate the number of ASHPs needed to meet GHG targets. But the timing of the resolution of the aforementioned policy decisions is another matter, which introduces significant current uncertainty with respect to setting ASHP targets at this time, as well as the ability to meet them.

The Low-Income Network looks forward to working with DEP on the development, implementation, and achievement of low-income electrification targets and thus contributing to the achievement of the Commonwealth's vital GHG reduction goals.

Respectfully submitted,
The Low-Income Weatherization and Fuel Assistance Program Network and
the Low-Income Energy Affordability Network,

By its attorney,

Jerrold Oppenheim, Esq.
57 Middle Street
Gloucester, Mass. 01930
978-283-0897
JerroldOpp@DemocracyAndRegulation.com

Dated: December 21, 2023

[2] For utility gas, estimates of GHG emissions from pipeline leaks are significant, though difficult to estimate; they may not be reduced by conversion of utility gas heat to ASHPs. Pipeline leak emissions have been estimated to be in a range from nearly equal to those from buildings to as much as 2.3 times, *i.e.*, pipeline emissions are nearly half to more than two-thirds of the total of pipeline and building emissions. Thus there is a limited relationship between ASHP installations in buildings -- addressed by propossed DEP targets and MassSave programs -- and total utility gas emissions, which are also addressed by other programs such as Gas Sysem Enhancement Plans (GSEPs). *See* G.C.. 164, sec, 145.
Conservation Law Foundation (CLF), *Getting Off Gas: Transforming Home Heating in Massachusetts*, (CLF, n.d., 2016?) at 6, 18, n.8; https://www.clf.org/wp-content/uploads/2020/12/CLF_GasWhitepaper_GettingOffGas.pdf; Maryann R. Sargent, Cody Floerchinger, Kathryn McKain, and Steven C. Wofsy, *et al., Majority of US urban natural gas emissions unaccounted for in inventories*, 118 Proceedings of the National Academy of Sciences No. 44 (PCAS) (Oct. 25, 2021), www.pnas.org/doi/10.1073/pnas.2105804118, https://doi.org/10.1073/pnas.2105804118.

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

December 20, 2023

To whom it may concern,

Thank you for the chance to deliver testimony on the Clean Heat Standard as it relates to climate change, a source of great concern for all of us. We're grateful for Secretary Tepper and MassDEP for working to create a program to reduce the use of fossil fuel heating within Massachusetts.

Maine Energy Systems is the premier manufacturer of modern wood pellet heating technologies for homes, businesses, municipal buildings (several DCR installations), and schools (Hampshire & Franklin Counties) across the Commonwealth and North America. Our technology delivers greater than 85% efficient central heating solutions which dramatically reduces the carbon footprints of buildings switching from fossil fuels. These combustion systems are incredibly clean and efficient, particularly when compared with fossil and blended biofuel alternatives. In light of this virtuous performance, we were disappointed to see that modern wood was not included in DEP's Clean Heat Standard draft, and **urge DEP to reconsider this decision, as it is <u>not</u> supported by science and makes the Commonwealth's aggressive climate change mitigation goals more difficult to achieve.**

We appreciate that the Department has made efforts to craft this important program as there have been numerous opportunities for public engagement. Accordingly, our coalition members have submitted comments, supporting modern wood heat's programmatic inclusion, citing extensive peer-reviewed research validating the decarbonization potential of wood, which in Massachusetts is almost exclusively "waste based" – residues from the sawmill and arboriculture sectors. We also believe we have proven that automated wood heating is the most affordable renewable fuel available for those without access to natural gas (very important for the rural, economically vulnerable), offering valuable relief to the electric grid, particularly in rural, electrically constrained areas. Despite this feedback, the draft CHS framework has excluded technologies such as solar thermal and modern wood heat in favor of heat pumps and liquid biofuels. This is out of alignment with other New England states, which chose to accept the merits of modern wood heat by making the fuel central to their thermal renewable and clean heating programs.

In comments previously submitted by the numerous stakeholders on the CHS, the evidence has shown wood heat to be an effective residential decarbonization choice. This fact is demonstrated by the State-funded research in the *Manomet* report which was very critical using biomass for power generation, <u>but recognized the significant benefits of thermal use of wood</u>. Further evidence has been provided by a peer-reviewed study in the journal *Energy* (with careful lifecycle GHG emissions analysis from the same prestigious lab used in the *Manomet* report) which showed wood to provide an immediate 50% reduction in carbon emissions when switching from fossil fuels. These facts are recognized by the Massachusetts Clean Energy Center by referring to modern wood heat as a "clean heating technology." The MassCEC goes further by showing the significant carbon emissions reductions from switching to modern wood heat (from fossil fuels) on their [*GoClean* residential energy website]. In fact, MassCEC 2020 data shows that modern wood heat actually provides greater carbon reductions than air-source heat pumps (using grid electricity). Regrettably 2022 ISO-NE data show that only 19% of New England's power was deemed renewable (including both Hydro and WTE power). The decarbonization benefit of modern wood heat is proven beyond all doubt and cannot be seriously questioned.

Despite the virtue of waste-based liquid biofuels, it is broadly understood that there are questions regarding its "availability" simply due to feedstock limitations. In contrast here are no such concern related to wood as a heating fuel. In fact, companies on the DOER's Massachusetts Biomass Suppliers List (last updated 12.22) provide sustainably verified wood fuel (pellet & chip) to the entire Commonwealth for systems enrolled in the Alternative Portfolio Standard (225 CMR 16.00). We hope that the DEP can recognize that all the pellet fuel involved in the APS is produced by a single manufacturer (Lignetics) at three of its most local mills (Strong, ME, Jaffrey, NH, Schuylerville, NY). This company has pledged to support the CES by providing data ensuring that their feedstock is sufficiency "Waste Based" to meet programmatic expectations.

Maine Energy Systems is proud that our whole-home pellet heating technologies are able to deliver 100% renewable, carbon-lean heating with de minimis impacts to air quality. This is an important recognition as the generation profile of grid power includes similar (albeit less renewable) per-btu impacts. To confirm these emissions impacts, the DOER commissioned an air quality study by UMass Amherst school of public health to evaluate the local air quality impacts of some of the Commonwealth's rural schools that had switched from oil to pellet boilers. Subsequent air sampling easily distinguished between the PM2.5 emitted by the boilers and the PM2.5 from other sources (vehicles, distillate heating systems, wind-blow soil). This distinction was possible because PM2.5 is simply a size descriptor instead of a measure of toxicity. The UMass Amherst study found that when schools made the switch from oil to wood, their air quality typically *improved* compared to the previous oil systems, and further hypothesized that the associated particulates were less dangerous to human health than the fossil-combustion particulates from the previous systems.

These findings are supported by numerous studies examining differences in PM2.5 and toxicity. One of the largest (a peer-reviewed study in the journal *Environmental Health Perspectives*) followed 445,000 Americans for 22 years, with full access to their medical records and detailed air emissions data from where they lived (100 municipalities). The study concluded that PM2.5 resulting from coal and diesel combustion (thermal & transportation) were significantly correlated with heart disease. However, this exhaustive study found find no such link between wood combustion and ischemic heart disease – the number one killer of Americans. Regrettably, most policymakers do not distinguish between different types (species) of PM2.5, choosing instead to assume universal levels of toxicity. This is simply not the case.

It is clear that heat pumps – both air and ground-source will account for the majority of future residential heating across the Commonwealth. That said, for the 5-7% of the Commonwealth that chooses to heat with wood, its inclusion in the Clean Heat Standard will provide a financial mechanism to facilitate the adoption of best-in-class technologies. Recognizing this minority fuel for its demonstrated decarbonization will offer residential adopters choice in their pathway to reducing dependence on fossil fuels. We hope that the DEP can appreciate that biogenic fuel combustion is not the cause of climate change…but it can help mitigate it. As such all renewable fuels are better than fossil fuels. Choosing to exclude this and other clean, renewable heating technologies will make it harder for the Commonwealth to reach its climate change mitigation goals at a time when every amount of carbon emissions reduction is precious.

For all these reasons, **we urge MassDEP to recognize the virtue of waste-based solid biofuels by amending the drafted Clean Heat Standard to include modern wood heat.**

Thank you for your consideration.

Sincerely,
Leslie B. Otten
Owner & Chief Executive Officer
Maine Energy Systems/Massachusetts Energy Systems

December 20, 2023

Michael Maravelias
188 Fairview Lane
Plymouth, MA 02360

Massachusetts Department of Environmental Protection
(climate.strategies@mass.gov)

Dear Climate Strategies Team,

I am writing this letter as a concerned citizen and engineer in the State of Massachusetts. My out-of-state employer is not and has not been involved in this process.

Massachusetts is known for advances in technology, fuel cells, robotics, healthcare, pharmaceuticals, biotechnology, and social programs. In addition, our brainpower and Universities are extraordinary. I applaud our efforts to be environmentally conscious. However, we are missing a large opportunity by not considering the entire market and giving everyone the freedom to choose environmentally beneficial technologies.

After attending the CHS program technical session on 12/7/23 and the virtual community meeting on 12/11/23, we must address more subjects for an effective CHS program.

**I recommend four things for a practical, equitable, progressive, and cost-effective policy to meet emission reduction goals:**

1. Fair and equitable representation for renewable fuels and environmentally beneficial technologies.
    - The current framework only includes biodiesel and heat pumps/electrification to meet compliance. This is not a comprehensive approach for success.
    - Why wait until 2028 to possibly include other beneficial fuel sources when we are asking most fuel companies to become involved at the start of the program?
    - We must immediately include beneficial technologies such as renewable propane, geothermal, and solar farms. Doing this will build a stronger program for emission reduction.

2. Accurately address the impacts of electrification and the resulting increase in carbon emissions from power plants in Massachusetts.
    - An increase in electricity requirements means more carbon emissions by burning natural gas. This negatively impacts air pollution. Electrification must be accurately scored because it is not a zero-carbon approach. In addition, electricity is a secondary energy source created by other fuel, energy, and mechanical sources. The electrification of Massachusetts will not help us reach our environmental goals. A framework that allows the freedom to choose environmentally beneficial technologies will help us. The links below explain the challenges with electrification.

- Greater electricity needs directly result in higher carbon emissions through the power generation process (creating electricity by the burning of methane gas to ultimately rotate turbines). The United States Environmental Protection Agency provides important pieces of the emissions puzzle. The EPA assessed that the electric power sector accounts for almost one-third of the total greenhouse gas emissions in the United States. Furthermore, the US EPA has clearly indicated that greenhouse gas emissions from electricity generation have increased. Overall, a stronger reliance on electricity will not benefit the Commonwealth's environmental goals. https://archive.epa.gov/epa/cleanpowerplan/learn-about-carbon-pollution-power-plants.html.
- Forbes has also discussed greater greenhouse gas emission from deep electrification: https://www.forbes.com/sites/judeclemente/2019/11/12/deep-electrification-means-more-natural-gas/
- There are many sets of data to analyze for an effective CHS program. I recommend reviewing the Carbon Intensity of the Energy Supply by State, Table 6 (1970–2021), presented by the US Energy Information Administration. Massachusetts has been on a steady path to success. However, a significant increase in electrical demand will increase our carbon intensity by energy supply (i.e., Power Plants). https://www.eia.gov/environment/emissions/state/index.php

3. Address the importance of a reliable and effective power grid in the Commonwealth.
   - Massachusetts ranks among the least reliable power grids in the United States.
   - This is a challenge that will grow if we only work to electrify as much as possible.
   - Please see: https://generatordecision.com/states-with-the-most-least-reliable-power-grids/#10-states-with-the-least-reliable-power-grids
   - A practical CHS framework that gives the freedom of choosing technologies must consider the limitations of our power grid.

4. During the virtual community meeting on December 11th, it was mentioned that Alternative Compliance Credits could be purchased to maintain program compliance and environmental correctness. An effective environmental program should never operate in this manner. A fair, equitable, and successful CHS program framework should not include this approach.

Thank you for accepting my comments. If you have any questions, please feel free to contact me.

All the best and be well. Happy Holidays!

Sincerely,

Michael Maravelias

Michael Maravelias
Environmental Engineer, MS MBA
mobile: 617-504-8900
maraveliasfamily@gmail.com

MASS COALITION for sustainable energy

December 21, 2023

By email to: climate.strategies@mass.gov

RE: Clean Heat Standard draft program framework – Comments and Request for extension of December 21 deadline

To whom it may concern:

On behalf of our members, the Mass Coalition for Sustainable Energy (MCSE) is writing to request that the Department of Environmental Protection (DEP) extend the comment period for the Clean Heat Standard (CHS) draft program framework ("the draft framework") for an additional sixty days, from the current December 21, 2023, deadline to February 21, 2024. The draft framework was publicly released on November 16, 2023, just a few days before Thanksgiving and the comment period coincides with the holiday season.

As a coalition with 19 members in the employer, business, labor, and homebuilding communities, representing many of the Commonwealth's largest and most important business associations—including seven statewide business organizations, nine regional chambers of commerce and several of the largest labor unions in Massachusetts—we are committed to addressing the climate crisis and aspire to be a valuable and engaged partner in this important rulemaking in the months ahead. The requested extension of the comment period will permit a full consideration of all stakeholder input, ensuing a successful CHS program while not delaying the implementation of an eventual CHS.

Although this proposal is a draft framework and not rulemaking, it will undoubtedly influence the final rule and therefore must be afforded a complete review by all stakeholders. The draft framework proposes to establish an enormous new program that would set very ambitious electrification goals, especially for residential housing and significantly impact energy markets in the Commonwealth. The draft framework would also assess new compliance obligation payments on all energy providers which will be passed on to homeowners and businesses and impact the Commonwealth's ambitious housing goals. These cost increases will likely far exceed those associated with the electricity price spikes we have experienced in Massachusetts during recent winters.

An extended comment period will allow stakeholders to prepare more detailed, thoughtful, and pertinent comments. To that end, our coalition is engaging an outside expert to perform modelling and analysis during this process. However, that work cannot be completed by December 21. At this point, we do offer these specific thoughts relative to the framework:

a. **Costs.** The evaluation of the CHS framework must include a quantification of the range and likely new costs that will ultimately pass on to builders and end users. The level and the predictability of costs is an essential component to the production of new housing and commercial development. As proposed, we believe the range and uncertainty of the draft framework costs will severely disrupt existing and future building activity.

b. **Fuel Diversity.** Decarbonization through the enhanced use of biogas and hydrogen provides the Commonwealth both greater energy security and affordability. As such, we are disappointed that the framework does not propose incentives for the building sector to encourage growth in the use of these fuels. This omission is particularly notable given that the framework does acknowledge the valuable decarbonization reduction benefits associated with scaling the use of biofuels as a means of avoiding the release of direct methane emissions into the atmosphere that would occur in the absence of biofuels. Furthermore, biogas use avoids the emissions associated with truck deliveries, as it uses the existing gas delivery system. Similarly, hydrogen yields zero direct emissions and also has the potential to yield large scale and swift emissions reductions in large industrial applications, particularly when produced using renewable energy.

c. **Carbon Targets.** Our read of the framework suggests that the new CHS program aims for a zero-emissions building sector in the Commonwealth by 2050, rather than achieving the goal set under Massachusetts law which is to reduce emission to *net-zero* as compared to 1990 levels. This difference is not a minor detail. In addition to being a significant departure from existing law, in a region such as New England with an aging building stock, eliminating all building sector emissions is simply not achievable. In addition, the cost differential between net-zero emissions and zero emissions is enormous – and ultimately borne by building owners and residents. We are deeply concerned that setting such an unrealistic objective will not create momentum for climate action but rather widespread opposition and controversy hindering meaningful and achievable emissions reductions and slowing progress at a moment when we can least afford it.

Our members appreciate the Administration's commitment to addressing the climate crisis and look forward to partnering with you to reduce emissions and keep the Commonwealth strong. Thank you for your consideration of these concerns.

Respectfully,

MASS COALITION for sustainable energy

LiUNA! NEW ENGLAND REGION Feel the Power

GREATER BOSTON PCA PLUMBING CONTRACTORS ASSOCIATION

NEW ENGLAND GAS WORKERS ALLIANCE

PLUMBERS • UNION • PIPEFITTERS • SPRINKLERFITTERS • STEAMFITTERS • SERVICE TECHS UA

aim

Cape Cod Canal Region CHAMBER OF COMMERCE

HBRA Home Builders & Remodelers Association MASSACHUSETTS

MNNELDC Massachusetts & Northern New England Laborers' District Council

NAIOP MASSACHUSETTS

NFIB

NEPONSET RIVER REGIONAL CHAMBER

North Central MASSACHUSETTS CHAMBER OF COMMERCE

NORTHEAST HEARTH, PATIO & BARBECUE ASSOCIATION NEHPBA

ONE SOUTHCOAST CHAMBER

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WesternMass Economic Development Council

WORCESTER REGIONAL CHAMBER OF COMMERCE RECRUIT | RETAIN | INCUBATE

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

Re: Clean Heat Standard

December 21, 2023

To Whom it May Concern,

The Massachusetts Municipal Wholesale Electric Company (MMWEC), the Commonwealth's designated joint action agency for municipal utilities, is thankful for the opportunity to submit these comments in response to the DEP's Clean Heat Standard (CHS) draft program framework.

MMWEC, a not-for-profit, public corporation and political subdivision of the Commonwealth, provides a variety of services to the state's consumer-owned municipal utilities, including power supply, financial, risk management, decarbonization/electrification programs and other services.

MMWEC and its municipal light plant (MLP) members take pride in the public power business model. Today, joint action and the public power business model work hand-in-hand to continue to bring superior service at the lowest cost to municipal utility customers, all while supporting public policies intended to reduce carbon emissions.

MMWEC and its member MLPs are strong supporters of decarbonization and electrification. They have been ahead of the curve when it comes to incorporating carbon-free resources and emerging technologies into their power portfolios, beginning back in 1982, when MMWEC signed a contract with Hydro Quebec to provide low-cost hydro energy to 32 MLPs. Today, all MMWEC members offer heat pump incentives, either through MMWEC's NextZero program or on their own.

More recently, MMWEC and its members played a critical role in developing the MLP Greenhouse Gas Emissions Standard (GGES), which requires the MLP power portfolios to include 50% carbon-free energy sales by 2030, 75% carbon-free energy sales by 2040 and net zero carbon emissions by 2050. These standards are aligned with those set for investor-owned utilities (IOUs), but unique to MLPs in recognition of the fact that MLPs have long-term contracts for power. Many MMWEC members have already met the 2030 goals, and all are continuously evaluating opportunities to ensure successful outcomes for their individual light departments. As the GGES is already in place, we question the need to layer another standard onto an industry committed to meeting emissions reduction targets.

While MMWEC and its members understand the need to fully electrify the Commonwealth's building sector, and offer heat pump programs and incentives, we have concerns about some aspects of the Clean Heat Standard as the DEP believes it applies to MLPs.

First, we do not believe this standard applies to MLPs as we do not believe DEP has the authority to mandate the MLPs to comply with this standard under c.21N. In addition, neither G.L. c.111 sec. 142A and 142B provide the DEP with the authority to impose a CHS on MLPs.

As to the concept of a Clean Heat Standard itself, our biggest concern is cost. While the recent report from the state's climate chief pegs the cost of a whole home heating conversion at $7,500, in reality, it costs three times that amount for many homes. Insulation, electric panel upgrades and other necessary work to make the

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conversion in certain homes, especially older ones, increases the cost exponentially. Indeed, many older homes are not good candidates for heat pump conversion. The work required to enable such a conversion costs upwards of $100,000 for older multi-family homes, found in many of our communities. Many customers, especially low and moderate income/environmental justice customers, cannot afford these costs.

The draft program framework cites the Mass Save program in several sections, most notably indicating that the cost of insulation and electric panel upgrades would not "count" towards a conversion because Mass Save already offers incentives for those. Most MLP customers do not have access to Mass Save incentives, but they do pay much lower rates – on average, 40% to 50% lower than IOU customers.

For heat pump conversions that occur in an MLP community that is serviced by IOU gas, and is therefore eligible for Mass Save incentives, it is unclear who receives the "credit" for conversions. There should be a requirement that clean heat credits generated in municipal service territories must be sold back to the utility within that service territory.

If it is expected that MLPs will match Mass Save heat pump incentives to increase adoption, it would be extremely costly to MMWEC's member utilities. Section II of the draft framework states that the regulations would require retail sellers of natural gas, heating oil, propane, and electricity to demonstrate compliance each year. It further states under subsection A, that the requirements for electricity sellers would be set in line with current building electrifications programs (i.e. MassSave). As one example, one of MMWEC's members, which provides both electric and natural gas service, would need to increase its residential rates by up to 81% from current rates by 2050 to comply with these mandates, perform necessary infrastructure upgrades, and decarbonize its residential heating sector (not including any inflationary adjustments or normal operating cost increases over this period). If the burden of the cost increases were not shared equally amongst rate classes, the residential sector would experience rate increases from current rates as high as 262% through 2050 (again, not including any normal operating cost increases). In a city with a high low-income population, this massive rate increase will place an unfair burden on many customers who are struggling to manage current rate structures. Shifting that cost share to the MLP's commercial and industrial sector would place an undue burden on those customers as well, which will lead to a loss of businesses and jobs, and a reduction in the tax base.

While there is the option of making alternative compliance payments in the event that the conversion targets are not met, we remain concerned about the cost burden on our ratepayers. MLPs pride themselves on offering lower rates while providing superior service, thereby lowering the energy burden on low-income customers. If the MLPs are forced to make alternative compliance payments to meet this standard, they will be forced to raise their rates, which will have a negative effect on their most vulnerable customers. These forced higher rates amount to mandatory ratemaking, which goes against the applicable enabling statute for MLPs. Individual MLP commissions/boards have sole responsibility for setting their rates.

It's also unclear where the alternative compliance funding goes. If the MLPs do not have access to these funds, it would make it even more challenging for the light departments to meet these mandates. We would suggest that if MLPs are included in this mandate, the standard includes language similar to that found in the MLP Greenhouse Gas Emissions Standard, in which the ACP "shall be deposited into a fund that shall be maintained and administered by the municipal light plant and such fund shall be used by the municipal light plant to fund greenhouse gas emissions reduction and related programs in its service territory."

As proposed, the standard will also result in increased rates due to higher loads during the times of year when power costs are highest (winter months). During winter peak periods, especially during extended cold snaps, heat pumps will be running continuously, jeopardizing the MLPs' ability to minimize their peak loads and reduce their transmission and capacity costs.

The draft framework makes no mention of the costs of upgrading the infrastructure necessary to accommodate the increased load expected from this program. This cost will be an additional burden on MLP customers, who will see higher rates as a result. The program essentially mandates electrification without visibility into how incremental supply/infrastructure will be commensurately built out to maintain reliability. Until infrastructure is solved for with at least a realistic plan, this has potentially region-wide and local distribution system negative impact.

In sum, we do not believe the state has a complete, accurate picture of the costs of implementing this program and how it will affect consumers. We would request that cost impact studies are completed for the municipal light plants before any standard is implemented.

In addition, we have questions regarding the online "compliance calculator," which seems to base the individual utility requirement on overall annual sales. We believe only residential sales should be included, as MLPs with more commercial and industrial customers and therefore higher loads, will have increased residential conversion requirements as a result.

Finally, we believe the standard will actually increase emissions in the short term. As carbon-free resources are slow to come online in the region and with a grid that is currently made up of approximately 50% fossil fuel resources, the increased load will likely be met with an increasing amount of fossil-fueled resources. It makes more sense to delay such a program until such time when more of the grid is supplied by carbon-free resources.

While MMWEC and its members fully support the need to electrify and decarbonize our sector, we would argue we are doing our part through the MLP GGES and various heat pump incentives for our customers. The MLPs do not need an additional mandate with unreasonable timelines and unknown costs.

Sincerely,

Kathryn M. Roy

Kathryn M. Roy
Director of Communications & External Affairs
MMWEC

Milton CAT
Power Systems Division

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December 21, 2023

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

RE: The MassDEP Clean Heat Standard Draft Framework Dear

Commissioner Heiple:

The Northeast Chapter of the Combined Heat and Power Alliance ("Northeast Chapter") welcomes the opportunity to provide comments regarding the MassDEP Clean Heat Standard ("CHS") Draft Framework as presented in the December 7, 2023 Technical Session. The Northeast Chapter is the successor organization to the Northeast Clean Heat and Power Initiative, which submitted several prior comments during the Alternative Energy Portfolio Standard (APS) proceedings. Additionally, our parent organization, the Combined Heat and Power Alliance, has submitted comments regarding the APS Minimum Standard Review.[1]

The Northeast Chapter is a group of manufacturers, system developers, engineers, and end- user representatives with the common goal of reducing energy costs and carbon emissions using the highly efficient and reliable technology of combined heat and power ("CHP"). The Northeast Chapter strongly believes CHP must play a crucial role in reducing marginal grid emissions in the near-term and bridging the gap as Massachusetts moves toward an electrified grid.

Based on comments during the Technical Session and other "Community" sessions, it is apparent that stakeholders are pleased with MassDEP's open-minded stance on its draft proposal. As such, we are pleased to submit the following comments highlighting several reasons to include CHP technologies in MassDEP' comprehensive decarbonization strategy.

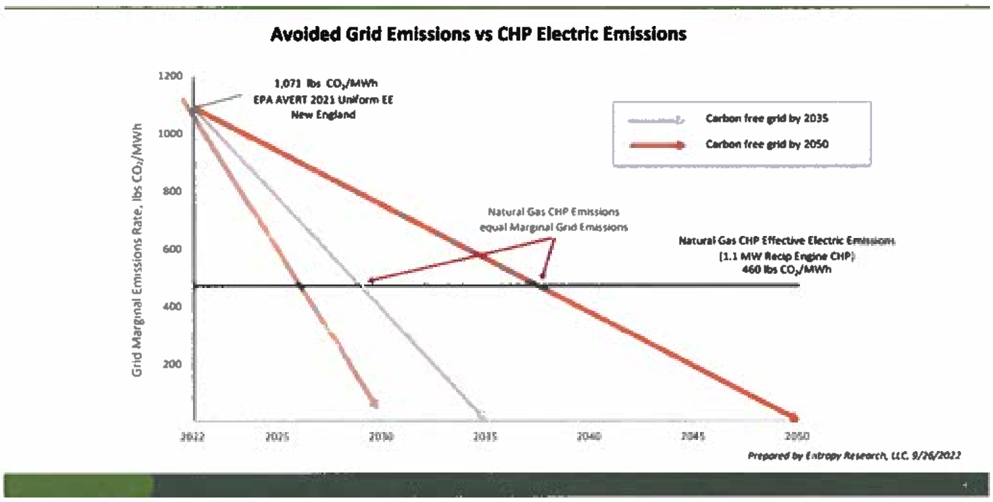
[1] CHP Alliance. "CHP Alliance Files Comments on the Massachusetts Department of Energy Resources APS Minimum Standard Review." December 4, 2020. https://chpalliance.org/chp-alliance-files-comments-on-the-massachusetts-department-of-energy-resources-aps-minimum-standard-review

1. **The Northeast Chapter strongly encourages the MassDEP to adopt a standard that is based on overall greenhouse gas reductions, is expressed in relation to those reductions, and is technologically agnostic regarding the method of achieving those reductions.**

The expressed purpose of MassDEP's Clean Heat Standard is to reduce climate pollution. However, the inclusion of "full electrification" as a requirement to receive credits means the standard, as drafted, will not be technologically agnostic. The Northeast Chapter urges the adoption of technologies, including CHP, that can provide actual carbon emissions now and support the transition to electrification. One of CHP's greatest strengths is that it is not a "technology lock in," but rather operates as a fuel- flexible system capable of using both low-carbon and zero-carbon fuels.[2] As such, it can serve as a shoulder technology, bridging the gap as Massachusetts seeks to move to full electrification. CHP is an established, high-efficiency technology recognized for reducing marginal grid emissions today by displacing dirtier grid resource $CO_2$ emissions, as demonstrated in Figure A. Carbon reductions today have more value than those in the future: "Because emissions are cumulative and because we have a limited amount of time to reduce them, carbon reductions now have more value than carbon reductions in the future. The next couple of decades are critical."[3] The Time Value of Carbon is the concept that greenhouse gas emissions eliminated today are worth more than cuts promised in the future, due to the escalating risks associated with the pace and extent of climate change.

Figure A:

Renewable and Net-Zero Carbon Fuels Maintain CHP's Advantage




[2] Today's existing and newly installed CHP systems can use a substantial blend of clean hydrogen – ranging from 20-100%, according to equipment manufacturers. CHP Alliance. "Clean Hydrogen and CHP: A Roadmap for Industrial and Commercial Decarbonization." March 2022. https://chpalliance.org/wp-content/uploads/2019/08/CHP-Hydrogen-Roadmap-2.pdf

[3] "Time Value of Carbon," Larry Strain. Carbon Leadership Forum. April 2020. https://carbonleadershipforum.org/the-time-value-of-carb

2. **The Northeast Chapter urges MassDEP to include CHP as part of its commitment to ensuring equity in the push to decarbonize and electrify of the Massachusetts grid.**

   As the MassDEP itself highlighted in its recap of Initial Stakeholder Comments from the May-August 2023 comment period,[4] CHP can provide crucial assistance in the equity space, as it can be and is presently being used to control costs and provide reliability within existing public housing infrastructure and healthcare facilities. Equity has consistently featured in both the presentations from the MassDEP and the comments solicited from various stakeholders. In such a crucial moment, the contributions of CHP to the broader equity discussion surrounding the CHS cannot be ignored.

3. **The CHS should credit renewable natural gas ("RNG"), certain biofuels, and hydrogen.**

   As currently proposed, the CHS would give two types of credits: one for full electrification and one for emissions reduction. Emissions reduction credits would be awarded on an ongoing basis and tied to, among other things, the delivery of eligible biofuels only. As noted by stakeholder comments, excluding other clean fuels until later review, will only discourage their use and development. The Northeast Chapter strongly believes that all clean fuels, including RNG, biofuels, and hydrogen, should be eligible for these credits immediately and that the proposed 2028 study to include other fuels be either eliminated or moved to the 2024-2025 timeframe. Additionally, the Northeast Chapter urges that the MassDEP reconsider its plan to offer other eligible liquid biofuels only half credits until 2030. The Northeast Chapter would again refer the MassDEP to its submission from September,[5] which highlighted the proposed Northeast Regional Hydrogen Hub, which was supported by seven regional states, including Massachusetts. Given the Commonwealth's prior support for hydrogen, it should be included along with other clean fuels in the MassDEP's proposed CHS.

   As proposed, the Draft Clean Heat Standard is not in complete alignment with the stated mission of the MassDEP. The expressed purpose of the CHS is to reduce climate pollution,[6] and as such, all credits given to solutions and technologies should be intrinsically tied to the life cycle reduction in GHG emissions that these methods provide. The CHS should be technology neutral and include non-electrification solutions, provided they deliver GHG reductions relative to fossil fuels.

Respectfully,
Milton CAT

Scott Martel
Vice President

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[4] MassDEP. "Clean Heat Standard, 2023 Initial Stakeholder Comments." May-August 2023. https://www.mass.gov/doc/chs-summer-2023-comment-summary/download

[5] NE Chapter of the CHP Alliance. "Comments on the Massachusetts Clean Heat Standard Program (CHS)." September 1, 2023. https://chpalliance.org/wp-content/uploads/2019/08/NE-Chapter-of-CHPA-Comments_Mass-Clean-Heat-Standard_8.31.23.pdf

[6] Regulatory Assistance Project. "A Clean Heat Standard for Massachusetts." June 2022. https://www.mass.gov/doc/clean-heat-standard-2-page-summary/download

December 21, 2023

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

**Feedback on Draft Clean Heat Standard Framework**

Dear Commissioner Heiple,

M-RETS Inc. submits the following comments in response to the Massachusetts Department of Environmental Protection's (DEP) recent Draft Clean Heat Standard (CHS) Framework.[1] Our organization is a 501(c)4 non-profit software provider; we own and develop the infrastructure that verifies and tracks environmental attribute certificates ("EACs"), including Renewable Energy Certificates ("RECs") and Renewable Thermal Certificates ("RTCs"). Since 2007, M-RETS has supported Renewable Portfolio Standards, Clean Energy Standards, Clean Heat Standards, RNG procurement, and Low Carbon Fuel Standard programs throughout North America. We specialize in facilitating transactions in renewable energy and thermal generation. Renewable thermal generation is issued a unique and traceable digital certificate for every dekatherm (Dth) generated from various renewable technologies. Renewable Thermal Certificates ("RTCs") encompass a wide range of technologies, including renewably produced hydrogen, ground source heat pumps, renewable natural gas, sewer/wastewater heat recovery, and many other evolving renewable thermal technologies. RTCs are the basis for tracking verifiable program and environmental attributes, including rigorously validated carbon intensity pathways using accepted Life Cycle Assessment (LCA) models such as Argonne National Lab's GREET, GHG Genius, or ISCC Plus. The verification and tracking of waste-derived renewable gases, such as renewable natural gas (RNG) and renewable hydrogen, for projects across North America is currently being facilitated in the M-RETS RTC tracking system. While the Draft CHS Framework does not include renewable gaseous fuels as part of Massachusetts' building decarbonization solution, the M-RETS RTC platform could easily facilitate tracking such fuels should this become a requirement in the final version.

M-RETS' expertise extends beyond issuing and tracking certificates; it is deeply involved in collaborating with stakeholders, market participants, regulators, and voluntary program administrators. This collaboration focuses on providing essential guidance and sharing best practices with state and provincial program administrators that require the tracking of environmental attributes from a trusted system with a proven track record. Our long-standing experience and dedication to renewable energy and thermal markets make M-RETS well-placed to serve emerging CHS programs. We would gladly serve as a resource for the Massachusetts DEP as you develop your program. The M-RETS board, leadership, and development team continually stress that at its core, M-RETS is a data provider. This core function and the M-RETS

[1] https://www.mass.gov/doc/chs-draft-program-framework/download

M-RETS

mission to serve as a centralized gateway to environmental markets are at the heart of everything M-RETS does. As a non-profit, M-RETS can provide unbiased feedback to regulators about the most efficient way to achieve their policy goals.  By working with M-RETS in the initial stages of program design, regulators are often able to save significant dollars by better understanding how to incorporate the platform's technical capabilities.

M-RETS supports the development of a CHS as an important policy for decarbonizing Massachusetts's existing building stock, including where fossil fuels are currently used to supply gaseous and liquid end-uses. M-RETS believes that including renewable gaseous fuels as part of Massachusetts CHS could be an essential part of building a decarbonization solution. **Should Massachusetts DEP include RNG and renewable hydrogen in your Clean Heat Standard, tracking those fuels in an EAC tracking system presents a significant opportunity for climate change mitigation in Massachusetts.**

I have attached an information sheet about the M-RETS RTC tracking system. We would be happy to assist your staff with how all aspects of the Massachusetts CHS could be implemented and tracked.

Sincerely,

Bryan Gower

Bryan Gower
Chief Client Services Officer (CCO)
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M-RETS
Renewable Thermal

# A GUIDE TO M-RETS RENEWABLE THERMAL

In the realm of environmental attribute tracking, a Renewable Thermal Certificate (RTC) stands as a distinctive representation of the environmental attributes entwined with the generation and utilization of one dekatherm (Dth) of renewable thermal energy. At the forefront of facilitating this representation is the M-RETS platform, which champions the utilization of rigorously validated carbon intensity pathways. These pathways are meticulously calculated through the application of the following models: Greenhouse Gases, Regulated Emissions, and Energy Use in Transportation (GREET) (available in California Air Resources Board/Low Carbon Fuel Standard, OR, and WA versions), Greenhouse Gas Genius, and the International Sustainability and Carbon Certification (ISCC).

What sets M-RETS apart is its commitment to providing users with the ability to tailor their RTC claims with precision. Through the utilization of these established models, individuals and organizations can handpick carbon intensities that align precisely with their unique environmental goals and considerations. This personalized approach ensures that the retirement process of RTCs accurately reflects the distinctive attributes of each thermal energy source.

In a world increasingly focused on sustainability and environmental responsibility, the utilization of RTCs and the sophisticated models supporting them mark a significant step forward in promoting the use of renewable thermal energy sources. It not only acknowledges the diverse nature of renewable thermal energy but also empowers stakeholders to make environmentally informed choices, contributing to a greener, more sustainable future.

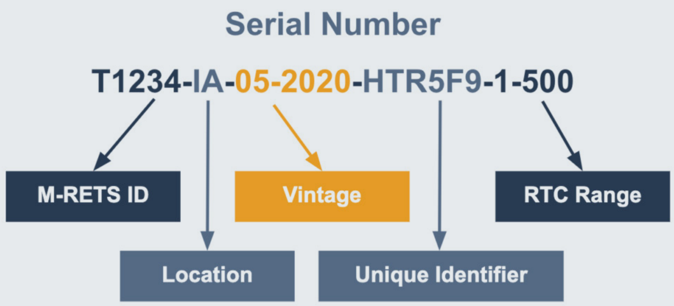
## Anatomy of an RTC

**Certificate details include:**

- Serial number
- Account
- Project
- Thermal resource
- Feedstock
- Vintage
- Location
- Quantity

*If applicable:*

- Eligibilities
- Carbon pathways
- IRE verification




### Why use the M-RETS Renewable Thermal (RTC) System?

The RTC Tracking System is a web-based tracking platform that supports existing markets by providing:

- Higher level of integrity through a verification and certification process for every dekatherm (Dth)
- Increased market transparency for counter parties and regulators
- Increase liquidity (both exchange-based and over-the-counter bilateral transactions)
- Scientifically validated carbon values to facilitate GHG reduction claims

M-RETS is a proven platform that has a long track record in commodity tracking among clean energy stakeholders. The State of WA and OR have designated M-RETS the compliance tracking system for their state clean fuel programs.

### M-RETS RTC System Subscription Types

I'm looking to...

| | Generator Only | General Subscribers | Independent Reporting Entity |
|---|---|---|---|
| Upload RTC Generation | ● | ● | ● |
| Hold RTCs | ● | ● | |
| Transfer RTCs | ● | ● | |
| Accept RTC Transfers | | ● | |
| Withdraw RTCs | ● | ● | |
| Retire RTCs | ● | ● | |
| Retire RTCs for State RPS Compliance | | | |
| Create Accounts for my RTCs | ● | ● | |
| Create Programs | | ● | |
| Participate in Programs | ● | ● | |

● Generator Only | ● General Subscribers | ● Independent Reporting Entity

For a full list of **subscription options** and **prices**, please refer to the fees section of the M-RETS website.

# Generator Registration

**To register a Generator, users must complete the following:**

1. A completed online generator registration form containing information related to the characteristics of the generating unit.
2. If applicable: A completed Schedule A from the M-RETS Terms of Use outlining the Generator Owner's Designation of Responsible Party.
3. M-RETS requires an Engineering Report, performed by a licensed PE. M-RETS may require additional documentation to verify the information submitted in the generator registration.
4. Determine if the generator will use an independent reporting entity (IRE).

## Step-by-Step Generator Registration Process

1. Creation of a generator
2. Generator is placed in a 'draft' status
3. Static data is entered, and the generator is submitted for approval
4. Generator is placed in a 'pending' status
5. M-RETS reviews the static data
6. If data is correct, M-RETS approves the generator
7. Generation can be uploaded

## Reporting Generation

*To ensure that double counting does not occur M-RETS requires that 100% of generation is reported.*

M-RETS facilitates the reporting of RTC qualified generation to issue RTCs not sold into a regulatory program (e.g., a state Low Carbon Fuel Standard ("LCFS") or the EPA Renewable Fuel Standard ("RFS") that may not use M-RETS).

### Independent Reporting Entity (IRE)

Based off the California LCFS program, we require the use of an IRE if you want to register and sell RTCs into the LCFS or RFS program.

### Self-Reporting

M-RETS allows generators to self-report generation data. Generation is reported via the user interface and M-RETS requires documentation to validate the quantity of generation reported.

## Fuel Sources

M-RETS issues RTCs from a diverse array of fuel sources, including but not restricted to green hydrogen, renewable natural gas (RNG), and biogas. For a comprehensive list of feedstock resources, please refer to Appendix B: Resource Type & Feedstock Source within the M-RETS Renewable Thermal Operating Procedures.

## Programs

Organizations can leverage certificates within vehicle fuels programs such as LCFS or RFS, contingent upon the official designation of M-RETS by the state program as an approved compliance tracking tool with the allowance for stacking. Additionally, M-RETS extends its eligibility to facilitate the establishment of state compliance programs using the M-RETS program feature.

### What is M-RETS?

M-RETS is a nonprofit, mission-driven organization that aims to grow renewable energy and renewable gas generation markets through digital infrastructure. The central objective behind M-RETS' online platform is to enhance market transparency, elevate the credibility of transactions beyond traditional paper attestations, and deliver the intrinsic value and liquidity required to bolster renewable thermal projects.

**Municipal Electric Association of Massachusetts**
**c/o Jane Parenteau, Secretary/Treasurer**
sec.treas@meam.org

MUNICIPAL ELECTRIC ASSOCIATION OF MASSACHUSETTS

**PUBLIC COMMENTS**

**TO:** Massachusetts Department of Environmental Protection

**FROM:** Municipal Electric Association of Massachusetts

**DATE:** December 21, 2023

**RE**: Comments—MASS DEP Clean Heat Standard (CHS) Draft Framework

The Municipal Electric Association of Massachusetts ( " MEAM") appreciates the opportunity to submit its comments regarding the Clean Heat Standard ("CHS") Draft Framework. MEAM is a statewide organization which is comprised of all 40 municipal light plants in Massachusetts and collectively provide 14% of the electric consumption in the Commonwealth. Municipal Light Plants ( "MLP's") are committed to providing efficient, clean and reliable electricity to their customers. The MLPs commitment to the reduction in greenhouse gas emissions is embodied in the Greenhouse Gas Emissions statute (c. 8 of the Acts of 2021) which was endorsed by MEAM.

However, MEAM reiterates its position (as articulated in its comments regarding the proposed Clean Energy Standard ('CES")); the Mass DEP does not have the statutory authority under c.21N of the Mass. General Laws to apply the proposed CHS to MLP's. Mass DEP has suggested in its proposed Draft Framework and in its response to inquiries at its public sessions that it does have such regulatory and statutory authority pursuant to c. 21N. MEAM would be pleased to provide a legal analysis in this regard (as it has in the past when the Clean Energy Standard was proposed). In any event MEAM requests an opportunity to meet with Mass DEP to discuss the issue of applicability. In order to facilitate such a discussion and to focus any areas of disagreement and/or agreement, MEAM would request that Mass DEP provide its analyses and legal reasoning as to how and why c. 21N provides the authority to the Mass DEP to apply the proposed CHS to MLPs. In addition, to be complete the Mass DEP legal analyses should include how and why Mass DEP G.L. c.111 sec. 142A and 142B provide the DEP with the authority to impose a CHS on MLP's.

The following comments are not intended to be exhaustive at this time but rather to highlight some of the key elements of the proposed Draft Framework without waiving any of MEAM's appellate rights regarding any proposed Mass DEP regulations applicable to Municipal Lighting Plants. It is hoped that the comments can serve foundationally for further in person discussions in this regard.

**CURRENT LAW REGARDING APPLICABILITY OF VARIOUS STATE PROGRAM TO MLP's**

The Renewable Energy Portfolio (RPS), the Alternative Portfolio Standard (APS), the Clean Peak Standard (CPS) and the Clean Energy Standard (CES) do **not** apply to MLP's. The most succinct overview is provided in the recent November 28, 2023 release of the Massachusetts 2021 Annual Compliance Report by the Massachusetts Department of Energy Resources. At page 2 of the Executive summary paragraph 6:

"The RPS, APS, CPS and CES regulations require Massachusetts retail electricity suppliers to obtain each year, a certain percentage of their retail customers' electricity supply from resources qualified under each portfolio standard. **The RPS, APS, CPS and CES requirements do not apply to municipal light plants**." ( emphasis added)

As the Mass DEP is aware and cited above, even without the RPS, APE, CPS and CES requirements, the MLP's have their own statutory clean energy requirements embodied in the Greenhouse Gas Emission Program specifically promulgated by statute. Therefore, MLP's are already obligated to reach their respective 100% Clean Energy goals by 2050. This fact then begs the question, why does MassDEP believe that it has such authority to include the MLP's in the CHS? MEAM's view is that c. 21N specifically applies to MLPs only with respect to reporting requirements.

**Why is the burden on the MLP's to require heat pump conversions?**

MLP's can encourage but not compel its customers to convert to heat pumps. If, after all of the various programs including MLP subsidies, residential customers may still be required to provide a substantial outlay of money to effect such conversion. Customers may simply refuse to expend the dollars required to convert. It appears, based on Mass Save's own number that the typical full home conversion is $22,000 (see: Mass Save Webpage: Residential rebates/air source heat pumps). That figure does not appear to include additional weatherization projects which may be required in the home to assure the most efficient outcome of the heat pump conversion. The figure may also not include the necessity to a upgrade 100 amp service to a 200 amp service to accommodate the conversion. The $22,000 number is likely higher today with a full year of inflation added. In addition, since the average MLP residential rate is approximately 40%-50 % lower than investor owned utility ("IOU") rates it will take twice as long to recoup their capital outlay than if the customer was served by an investor owned utility. In addition, heat pumps are likely to have a shorter life expectancy than gas or oil fired furnace systems which will further increase life-cycle costs for the MLP customers. An MLP customer may do the math and decide that these factors may not justify their out of pocket expenses to convert.

**The Alternative Compliance Payments are essentially MLP regulatory ratemaking.**

ANY mandatory compliance payment without statutory authority must result in rate increases. As the Mass DEP is aware, ONLY MLP Boards can establish rates as is the local control authority bestowed upon MLPs by a long legislative history. If MLP's cannot meet their respective annual conversions they must set money aside to make compliance payments. It is still their respective ratepayers who must underwrite the costs through the MLP's rates. The

MLP board would have no alternative but to incorporate the Alternative Compliance Payment ("ACP") costs into its rates, essentially ratemaking by the MassDEP and violative of statutory authority exclusive to MLPs.

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**MLP's do not participate in Mass Save but rather have their own programs or programs offered by the Massachusetts Municipal Wholesale Electric Company or Energy New England.**

If the ACP payments are to be assigned and distributed through various existing state programs, including Mass Save, this could result in MLP customers paying to assist in installations in IOU service territories! Any ACP payments by an MLP must go back to assist programs in the respective MLP making the payment.

**MLP's have invested in their own heat pump conversion programs approved at the local level.**

MLP's have not ignored heat pump conversion programs and in fact almost 90 % of MLP's already have existing heat pump conversion programs. Some MLP's have programs which offer up to $10,000-$15,000 dollars in rebates! These programs are **approved** at the local level by Municipal Light Boards after discussions at public meetings. The programs are reflected in the customer rates which are also approved by the Municipal Light Board.

**Heat Pump installers could sell Clean Energy Credits created by MLP projects to an IOU.**

This dichotomy could result in MLP's not receiving credits for their own project! The MLP's would be paying to incentivize kwh conversions in their service territory without the attendant benefit of credits. Since MLP's do not have the vast customer base as an IOU it would be imperative that any such credit generated as a result of an MLP conversion MUST be credited back to the MLP from which it originated**.**

**The annual amount of sales by 'fuel suppliers" (which would include MLP's as per the proposal) is the basis from which an annual requirement for residential conversions is calculated for each MLP**.

It appears that the statewide annual Mwh sales volume is not limited to residential sales but also includes commercial and industrial sales. Those annual sales amounts are then utilized to determine the annual number of each MLP's heat pump conversion obligations. This could create a disincentive to commercial or industrial base customer to expand ( or an incentive to relocate) as it would require an increase in the annual compliance obligations and result in an increase in rates across both the commercial, industrial as well as residential rates in order to meet the MLP's residential electrification requirements.

**Unlike IOU's, MLP's are not homogenous in their respective load customer demographic characteristics.**

MLP's vary in size from a few hundred customers with little or no commercial or industrial base, to those with tens of thousands of customers. Russell MLP has 470 customer meters with little or no commercial and industrial customers. Taunton MLP on the other hand serves 39,000 customer meters with both a commercial and industrial base. Some larger MLP's have a higher percentage of low income customers than most MLP's such as Holyoke MLP.. Holyoke's MLP for example may have proportionately higher ACP payments due to the inability of various lower income customers to afford the conversion costs even with the various subsidy programs. The two major investor owned electric companies have a much broader customer base upon which to meet their annual CHS requirements and can simply pass through such increased costs through their rate filings with the Massachusetts Department of Public Utilities. In addition, perhaps it is best that the Massachusetts proceed with the distribution of monies received pursuant to the Inflation Reduction Act ("IRA") which will provide additional incentives to residential customers before it proceeds with development and imposition of a CHS on MLP's.

**MLP's should not be conflated with investor owned utilities ('IOU's").**

As the Mass DEP is aware, MLP's have no investors and are self-regulated. They are governed by different statutory schemes. While IOU's are organized as profit making entities, MLP's do not have shareholders and their return is capped by statute and operated under the supervision of public officials. In a meeting with the MassDEP MEAM would be anxious to discuss and delineate the numerous differences between the two types of entities in addition to the statutory schemes governing each.

MEAM believes that it is essential that MassDEP fully appreciates not only the clear statutory schemes which distinguish MLPs requirements from those of IOU's but also the practical implications of imposing a Clean Heat Standard on the 40 unique MLP's in Massachusetts. Municipal Light Plants in Massachusetts have and continue to be the beacon of leadership in clean energy. MEAM would once again request a meeting with MassDEP in order to address the issue of applicability of c.21N to MLP's.

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nationalgrid

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

December 21, 2023

Dear Commissioner Heiple,

On behalf of National Grid, thank you for the opportunity to provide comments on the Draft Clean Heat Standard Framework. National Grid is committed to enabling a fair and affordable clean energy transition and achieving the Commonwealth's statutory requirement for net-zero emissions by 2050. Our commitment to climate action is reflected in our Clean Energy Vision, our Responsible Business Charter, and our recent commitment through the Science Based Targets Initiative (SBTi) to reduce emissions consistent with limiting global temperature increase to 1.5C degrees or less. National Grid fully supports efforts aimed at accelerating electrification, expanding renewable power generation, and doubling the rate of energy efficiency retrofits, all while ensuring the energy transition is both affordable and equitable. We also believe there is an important role for the gas distribution network to support and enable deep decarbonization by transforming to deliver low-carbon fuels for difficult to electrify applications and to lower the overall societal cost of the energy transition.

A Clean Heat Standard is 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 welcome the opportunity to contribute 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.

National Grid appreciates MassDEP's work developing this draft framework, and the opportunity to participate in a robust process. While the draft framework needs more work, we hope our comments here today can help develop a CHS that will achieve the important decarbonization objectives shared by National Grid and the Commonwealth. Additional data, analysis, and stakeholder engagement are necessary to ensure the CHS achieves cost-effective and equitable emissions reductions and leaves no Massachusetts families or businesses behind. We recommend aligning the CHS with the recommendations in Appendix B of the Massachusetts Clean Energy and Climate Plan (CECP) for 2025 and 2030[1] and ask for more information about why those recommendations were not incorporated more fully into this draft framework. Overall, the draft framework could do more to advance additional options for cost-effective emission reductions, accurately assess the greenhouse gas (GHG) emissions associated with clean heat measures and the legacy systems they will replace, avoid inequitable cost increases for low-to-moderate income (LMI) customers and energy-intensive businesses, better integrate with energy efficiency and building electrification measures under Mass Save®, and harness the value the gas industry workforce and gas infrastructure can bring to the clean energy transition.

Recognizing this draft framework is only one step in a longer rulemaking process that will ultimately include draft regulations, we look forward to working closely with MassDEP and other stakeholders to develop and implement a CHS that will ensure the transition to clean heat is affordable and equitable for all Massachusetts families and businesses and that the Commonwealth's energy system remains safe and reliable into the future.

[1] https://www.mass.gov/doc/appendices-to-the-clean-energy-and-climate-plan-for-2025-and-2030/download

National Grid offers the following specific comments for your consideration, organized according to the four topic areas included in the Draft Framework document:

**Topic #1: Setting the Standard**

National Grid supports a Clean Heat Standard that will maximize cost-effective reductions of GHG emissions according to full life cycle emissions accounting. The draft framework, however, is not structured to maximize cost effective emissions reductions, does not accurately assess life cycle emissions, and is not aligned with the recommendations included in Appendix B of the CECP. Under the proposed framework, credit generation and compliance are not correlated with the emissions reductions associated directly with a clean heat measure. Instead, all electrification measures are treated equally, and accredited as if emissions from electricity generation are zero. This approach does not the account for the substantial real-world variability of emissions reductions from clean heat measures due to differences in equipment efficiency, building typology, emissions from power generation, and many other factors.

We encourage MassDEP to set the standard according to verified, real-world emissions reductions according to a full life cycle analysis, not completion of electrification "projects" irrespective of emissions reductions. Further, we recommend using an established scientific accounting methodology to assess life cycle emissions, such as Argonne National Laboratory's GREET model, which has been established as the federal standard for emissions accounting under the Inflation Reduction Act (IRA). Doing so will ensure the program focuses on emissions reductions and help ensure more equitable achievement of emissions reductions at the lowest marginal cost. Basing the standard on actual emissions reductions is supported by Appendix B of the CECP, including that "credits should be measured in terms of CO2 equivalents (CO2e), which would give credit for the CO2 emissions avoided by the addition of a variety of clean heat solutions."[2]

**Topic #2: Regulated Heating Energy Suppliers**

National Grid agrees with the draft framework that energy suppliers should be the obligated entities under the CHS, but the framework should be more closely aligned with the recommendations in Appendix B of the CECP, which calls for the standard to be administered on a "competitively neutral basis."[3] Each energy supplier, who best understands their specific customers and who likely already works with their customers to help them meet their own sustainability goals, should be empowered to deploy clean heat measures directly to help reduce their customers' emissions.

While other obligated entities have options for compliance that are within their control or ability to meet, natural gas utilities are not able to deploy any qualifying clean heat measures under the draft framework other than through programs already funded under Mass Save®. This is contrary to the recommendation in Appendix B of the CECP that "obligated parties should have the option to generate credits directly by helping customers install different emissions reduction measures (e.g., heat pumps and weatherization in buildings) *or by purchasing and selling zero-to low-carbon fuels to customers*, as this is the simplest way for them to comply with the CHS" [emphasis added].[4]

Under the draft framework, gas utilities would be required to rely on purchasing credits from an untested marketplace or paying Alternative Compliance Payments (ACPs) to meet the compliance

[2] Id., p. 50
[3] Id., p. 73
[4] Id., p. 66

obligation, instead of directly deploying clean heat measures. If the focus of the draft framework moved from projects completed to emissions reduced and utility-delivered alternative fuels became eligible to generate clean heat credits, the price signal passed along to gas customers as a commodity surcharge would reflect the actual emissions associated with heat energy, encouraging reduction in the use of fossil fuels in favor of cleaner alternatives. Instead, the proposed framework would simply charge utility customers more for the same fossil fuels, without providing a pathway to reduce the carbon intensity of the gas they rely upon.

**Topic #3: Credit Generation**

Two important aspects of the proposed approach to credit generation should be addressed: the exclusion of available cost-effective clean heat measures, and the generation of credits irrespective of actual emissions reductions.

The scope and scale of the challenge of decarbonizing heat energy in Massachusetts is massive. Buildings and industrial heat make up more than one-third of all energy consumed in the Commonwealth, more than any other sector.[5] Natural gas provides around two-thirds of our heat energy annually, and the natural gas network delivers three times the amount of energy as the electric grid on their respective peak days.[6] We simply cannot afford to leave clean heat resources off the table if the CHS is to successfully decarbonize this largest segment of our energy economy. While National Grid agrees with the policy outlined in the CECPs that electrification should be a cornerstone strategy for decarbonizing buildings in Massachusetts and is actively working to scale up deployment of electrification today, the proposed framework does not adequately address the need for fuels to serve difficult-to-electrify applications.

According to the 2050 CECP, fuel combustion will continue to play an important role – including for building heat – even beyond 2050, and alternative, low-carbon, non-fossil fuels will play an important role in ensuring families and businesses across the Commonwealth have access to decarbonized heat.[7] Further, Appendix B of the 2030 CECP is explicit in calling for the CHS to "permit a range of technologies and fuels to compete for the ability to earn clean heat credits," including utility-delivered biofuels and clean hydrogen, and says "diversity in creditable clean heat measures will promote a quicker and less expensive transition.[8] We agree. **Consequently, the CHS should include utility-delivered low-carbon fuels as eligible credit-generating technologies to ensure the low-carbon fuels called for in the CECP are available in 2050.** Eligible technologies to enable 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 pipeline-delivered biofuels and clean hydrogen. The draft framework focuses on electrification through heat pumps, leaving cost-effective emissions reductions measures on the table. Here the proposed framework is again inconsistent with the recommendations in Appendix B of the CECP, which clearly states that the CHS should be a "performance standard, not a technology mandate."[9] As proposed, the CHS is a heat pump technology mandate with a limited carve out for certain delivered fuels, not a true performance standard.

[5] https://www.eia.gov/state/seds/
[6] https://thefutureofgas.com/content/downloads/20-80%20NG%20Proposal%20Draft%20(03-08-2022)_Final.pdf, p. 4
[7] https://www.mass.gov/doc/2050-clean-energy-and-climate-plan/download, p. 102
[8] https://www.mass.gov/doc/appendices-to-the-clean-energy-and-climate-plan-for-2025-and-2030/download, p. 61
[9] Id., 60

Further, the proposal to generate credits for completion of electrification projects is fundamentally misaligned with the recommendations in Appendix B of the CECP, which calls for “a crediting system that focuses on counting tons of GHG reductions” to “ensure that emissions reductions are prioritized and quantified.”[10] As referenced above and discussed extensively in our previous comments to MassDEP, the best way to ensure effective, affordable, and equitable outcomes is for the CHS to focus on real-world GHG emissions reductions, established according to a life cycle assessment under a scientific model like GREET, adapted to Massachusetts’ unique circumstances and priorities. **Credits should be generated according to actual emissions reduced by a clean heat measure.** Instead, the draft framework uses a generalized, estimated emissions factor for clean heat conversions which does not consider the emissions implications of various technologies and equipment, different building typologies, or the carbon intensity of the electricity supply.

While many customers may be readily able to convert to a fully electrified heating system, others, including many LMI customers and energy-intensive businesses, will face barriers to electrification that could put affordable decarbonization out of reach for many if a diverse portfolio 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, others who may not be able to afford new heating equipment today, and businesses with energy needs that are difficult to electrify. Even in scenarios such as via income-eligible programs delivered through Mass Save® programs where equipment and installation cost obstacles can be removed through the provision of “no cost to customer” measures, operating cost differentials at current retail energy prices remain a significant barrier to customer adoption of heat pumps and an equitable energy transition. Despite the “equity carve out” for increasing the relative share of heat pumps deployed in LMI households, the framework does not adequately address the needs of LMI and other customers who cannot feasibly or affordably electrify, or the risk of higher monthly energy bills that may result from conversions.

The framework should also do more to provide for a just and equitable transition for gas industry workers, and to ensure the Commonwealth’s energy workforce is positioned to deliver the energy transition for the Commonwealth. Unfortunately, the proposed framework puts gas industry workers at risk by providing for no options to enable repurposing and transforming the physical infrastructure of the gas network to deliver clean energy. Gas industry workers, including the more than 3,300 union members of 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 should be empowered to help enable a clean energy future.

**<u>Topic #4: Compliance Flexibility and Revenue</u>**

We appreciate the attempt by MassDEP to create an ACP system that emphasizes the use of the funds for projects and measures targeting low-income customers to make the energy transition more just and equitable, while also acknowledging that there will be some fluctuations to a regulated entity’s ability to comply with the emissions reduction requirement during colder weather years. However, deeper analysis is necessary to set the appropriate ACP levels since the ACP will essentially function as a cap on credit prices. We urge MassDEP to share the analysis behind the proposed ACP levels and undertake deeper engagement with stakeholders to ensure the ACP is set at the appropriate level before moving forward.

[10] Id., p. 50

Additionally, National Grid is concerned about the interplay between the draft CHS framework and existing energy efficiency and building electrification measures delivered under Mass Save®. Throughout the draft framework, MassDEP makes references to Mass Save® programs and connecting the goals of that program with the mandates of a CHS program. While we do believe the two programs can be complementary, the draft CHS framework needs further clarification to ensure the program does not conflict with the statutory mandates behind existing Mass Save® energy efficiency and electrification requirements. As it stands, the Secretary of the Executive Office of Energy and Environmental Affairs sets emission reduction targets for the Three-Year Plan, which are then achieved through an array of program offerings, including energy efficiency measures, weatherization, and heat pump deployment delivered through electric and gas program administrators (but not through municipal electric and gas utilities). As written, the draft framework risks imposing additional and overlapping emission reduction targets for those utilities already covered by the Mass Save® program. Further, the draft framework includes additional obligations on Mass Save® program administrators that will likely increase electricity rates, thereby increasing a barrier to electrification for residents and businesses.

Finally, the Green Communities Act requires a robust stakeholder process during the drafting of each Three-Year Plan through the Energy Efficiency Advisory Council (EEAC). This process includes an equity working group that includes environmental and equity advocates from throughout the Commonwealth. Once drafted, the Three-Year Plans are then approved by the Department of Public Utilities (DPU). This process ensures a collaborative and inclusive public process that is well tested. However, the way in which the draft framework contemplates linking the requirements of the CHS with Mass Save® creates the potential for duplicative or conflicting mandates. It is possible for the two programs to exist in a complementary manner, but as currently contemplated the draft CHS framework does not accomplish this.

In all, National Grid is supportive of MassDEP’s efforts to design and implement a Clean Heat Standard for Massachusetts. Going forward, we urge MassDEP to align with the recommendations Appendix B of the CECP, and appreciate consideration of these comments in their entirety. Further, we encourage MassDEP to provide a public explanation for quantitative aspects of the framework, including emissions reductions assumptions for clean heat measures and ACP levels, alongside the data that supports these decision points, to enable a thorough, transparent, and effective process.

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 a just, affordable, and equitable transition to a clean energy future.

Sincerely,

Huck Montgomery
Director, US Policy & Regulatory Strategy
National Grid

## Parnay, Angela L (DEP)

**From:** Jim Edelson <jim@newbuildings.org>
**Sent:** Thursday, December 21, 2023 2:53 PM
**To:** Strategies, Climate (DEP)
**Subject:** Comments on CHS Framewlork



**Re: Request for comments on the Massachusetts Clean Heat Standard Framework, Dec. 2022**

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 earlier in the year partially focused on **Accurately crediting CI reductions in delivered fuels**. We requested that the CHS accurately reflect the emission reductions of fuels through accurate carbon intensity accounting. We are pleased that that Framework accomplishes this in part by citing the Eligible Liquid Biofuels definition in 225 CMR 16.0. We also appreciate limiting the further crediting of EPA renewable fuels to a 50% rate of the Eligible Liquid Biofuels, and only through 2030. We believe that accurately reflecting the carbon intensity of delivered fuels is essential to a credible and effective Clean Heat Standard thar can achieve the policy goals of the Commonwealth.

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North East Biosolids & Residuals Association

*Cooperatively promoting the environmentally sound recycling of biosolids and other residuals*



December 21, 2023

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

RE: Clean Heat Standard (CHS) Draft Framework

Dear Commissioner Heiple:

I write to you today on behalf of the North East Biosolids and Residuals Association (NEBRA) and our members with comments on the Massachusetts Department of Environmental Protection (MassDEP)'s Draft Clean Heat Standard (CHS) framework document.

NEBRA is a non-profit professional association promoting sustainable diversion, recycling and beneficial use of biosolids and residuals from the municipal and industrial sectors. NEBRA supports the use of biosolids for an array of beneficial end uses, such as generating renewable energy. Several of our members in Massachusetts – including the Massachusetts Water Resources Authority and the Greater Lawrence Sanitary District (GLSD) -- are successfully generating power from biosolids by anaerobically digesting these organic materials to produce biogas. GLSD is also co-digesting food waste with its biosolids.

On behalf of all of members in Massachusetts, we want to express our concerns with the draft CHS framework and its exclusion of renewable natural gas (RNG) as a clean heat measure under the program design. The MassDEP's 2030 Solid Waste Master Plan, issued in October 2021, touts the benefits of anaerobic digestion (AD) as a means of diverting waste and creating new market and business opportunities in the Commonwealth. We appreciate that MassDEP values the role of AD and has chosen to make significant investments through grant opportunities to expand the use of these systems and to expand the market for their adoption. Given this level of commitment to AD in the past, we were disappointed to see MassDEP overlook RNG under the draft CHS framework.

NEBRA members have the capacity to enable the local production of RNG to provide clean heat for Massachusetts homes and businesses. We believe one of most impactful policies to incentivize AD would be to include RNG as an eligible technology under the CHS. It is possible in the future for locally-produced RNG to be delivered over the existing utility gas network to customers with difficult-to-electrify energy needs.

Including RNG in the CHS would complement the Solid Waste Master Plan by creating an economic driver for increased AD and much-needed outlets for biosolids. The Commonwealth generates approximately 2,475 wet tons of biosolids *every day*, the equivalent of 88 tanker truck loads that need to be managed. Using AD technology to manage these materials produces clean energy, reducing greenhouse gas emissions. This is a win-win for the waste sector and for the energy sector. We therefore encourage MassDEP to reconsider the role of RNG in the CHS program design to ensure the Commonwealth's priorities are consistent and result in the greatest possible support for expanding AD and reducing greenhouse gases while generating RNG.

NEBRA and our members appreciate MassDEP's efforts to make the Commonwealth's waste and energy systems more sustainable. We urge you to include RNG as an eligible clean heat technology to support our shared goals.

Sincerely,

Janine Burke-Wells,
Executive Director

*__The North East Biosolids and Residuals Association (NEBRA)__ is a 501(c)(3) non-profit professional association advancing the environmentally sound and publicly supported recycling of biosolids and other organic residuals in New England, New York, and eastern Canada. NEBRA membership includes the environmental professionals and organizations that produce, treat, test, consult on, and manage most of the region's biosolids and other large volume recyclable organic residuals. NEBRA is funded by membership fees, donations, and project grants. Its Board of Directors are from CT, MA, ME, NH, RI, and Nova Scotia. NEBRA's financial statements and other information are open for public inspection during normal business hours. For more information: http://www.nebiosolids.org.*

December 21, 2023

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

RE: The MassDEP Clean Heat Standard Draft Framework

Dear Commissioner Heiple:

The Northeast Chapter of the Combined Heat and Power Alliance ("Northeast Chapter") and the undersigned businesses, trade associations, engineering firms, and industry experts welcome the opportunity to provide comments regarding the MassDEP Clean Heat Standard ("CHS") Draft Framework as presented in the December 7, 2023 Technical Session. The Northeast Chapter is the successor organization to the Northeast Clean Heat and Power Initiative, which submitted several prior comments during the Alternative Energy Portfolio Standard (APS) proceedings. Additionally, our parent organization, the Combined Heat and Power Alliance, has submitted comments regarding the APS Minimum Standard Review.[1]

The Northeast Chapter is a group of manufacturers, system developers, engineers, and end-user representatives with the common goal of reducing energy costs and carbon emissions using the highly efficient and reliable technology of combined heat and power ("CHP"). The Chapter strongly believes CHP must play a crucial role in reducing marginal grid emissions in the near-term and bridging the gap as Massachusetts moves toward an electrified grid.

Based on comments during the Technical Session and other "Community" sessions, it is apparent that stakeholders are pleased with MassDEP's open-minded stance on its draft proposal. As such, we are pleased to submit the following comments highlighting several reasons to include CHP technologies in MassDEP's comprehensive decarbonization strategy.

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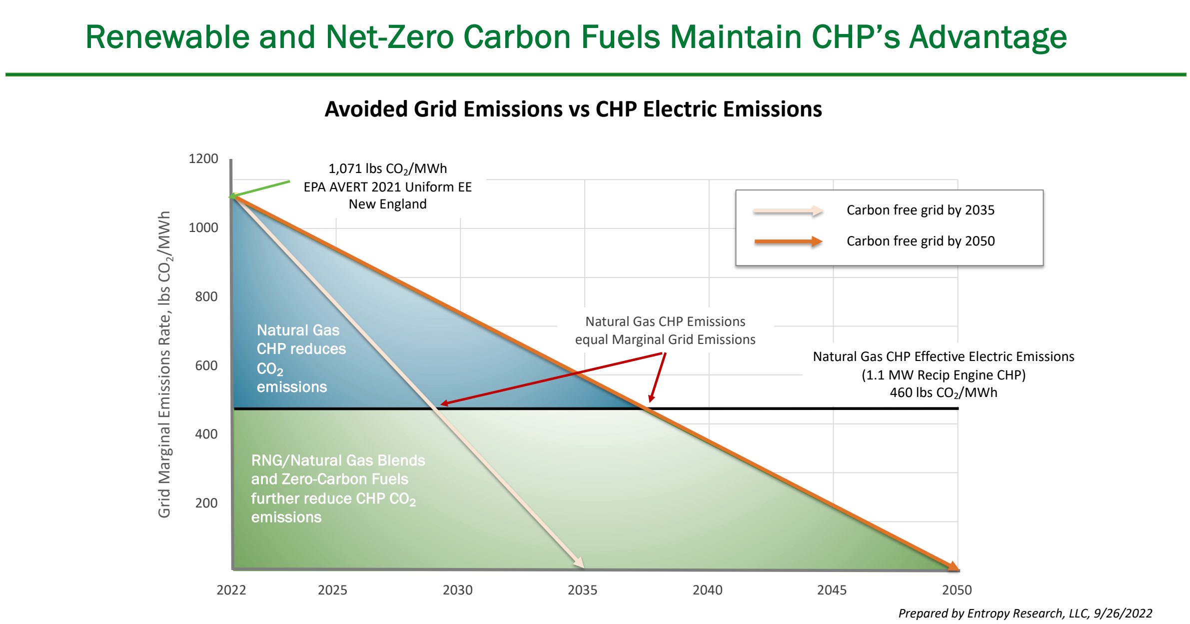
[1] CHP Alliance. "CHP Alliance Files Comments on the Massachusetts Department of Energy Resources APS Minimum Standard Review." December 4, 2020. https://chpalliance.org/chp-alliance-files-comments-on-the-massachusetts-department-of-energy-resources-aps-minimum-standard-review/

1. **The Northeast Chapter strongly encourages the MassDEP to adopt a standard that is based on overall greenhouse gas reductions, is expressed in relation to those reductions, and is technologically agnostic regarding the method of achieving those reductions**.

The expressed purpose of MassDEP's Clean Heat Standard is to reduce climate pollution. However, the inclusion of "full electrification" as a requirement to receive credits means the standard, as drafted, will not be technologically agnostic. The Northeast Chapter urges the adoption of technologies, including CHP, that can provide actual carbon emissions reductions now and support the transition to electrification. One of CHP's greatest strengths is that it is not a "technology lock in," but rather operates as a fuel-flexible system capable of using both low-carbon and zero-carbon fuels. As such, it can serve as a shoulder technology, bridging the gap as Massachusetts seeks to move to full electrification. CHP is an established, high-efficiency technology recognized for reducing marginal grid emissions today by displacing dirtier grid resource CO2 emissions, as demonstrated in Figure A. Carbon reductions today have more value than those in the future: "Because emissions are cumulative and because we have a limited amount of time to reduce them, carbon reductions now have more value than carbon reductions in the future. The next couple of decades are critical." The Time Value of Carbon is the concept that greenhouse gas emissions eliminated today are worth more than cuts promised in the future, due to the escalating risks associated with the pace and extent of climate change.

Figure A:



2. **The Northeast Chapter urges MassDEP to include CHP as part of its commitment to ensuring equity in the push to decarbonize and electrify of the Massachusetts grid**.

As the MassDEP itself highlighted in its recap of Initial Stakeholder Comments from the May-August 2023 comment period,[2] CHP can provide crucial assistance in the equity space, as it can be and is presently being used to control costs and provide reliability within existing public housing infrastructure and healthcare facilities. Equity has consistently featured in both the presentations from the MassDEP and the comments solicited from various stakeholders. In such a crucial moment, the contributions of CHP to the broader equity discussion surrounding the CHS cannot be ignored.

3. **The CHS should credit renewable natural gas ("RNG"), certain biofuels, and hydrogen.**

As currently proposed, the CHS would give two types of credits: one for full electrification and one for emissions reduction. Emissions reduction credits would be awarded on an ongoing basis and tied to, among other things, the delivery of eligible biofuels only. As noted by stakeholder comments, excluding other clean fuels until later review, will only discourage their use and development. The Northeast Chapter strongly believes that all clean fuels, including RNG, biofuels, and hydrogen, should be eligible for these credits immediately and that the proposed 2028 study to include other fuels be either eliminated or moved to the 2024-2025 timeframe. Additionally, the Northeast Chapter urges that the MassDEP reconsider its plan to offer other eligible liquid biofuels only half credits until 2030. The Northeast Chapter would again refer the MassDEP to its submission from September,[3] which highlighted the proposed Northeast Regional Hydrogen Hub, which was supported by seven regional states, including Massachusetts. Given the Commonwealth's prior support for hydrogen, it should be included along with other clean fuels in the MassDEP's proposed CHS.

As proposed, the Draft Clean Heat Standard is not in complete alignment with the stated mission of the MassDEP. The expressed purpose of the CHS is to reduce climate pollution,[4] and as such, all credits given to solutions and technologies should be intrinsically tied to the life cycle reduction in GHG emissions that these methods provide. The CHS should be technology neutral and include non-electrification solutions, provided they deliver GHG reductions relative to fossil fuels.

[2] MassDEP. "Clean Heat Standard, 2023 Initial Stakeholder Comments." May-August 2023. https://www.mass.gov/doc/chs-summer-2023-comment-summary/download
[3] NE Chapter of the CHP Alliance. "Comments on the Massachusetts Clean Heat Standard Program (CHS)." September 1, 2023. https://chpalliance.org/wp-content/uploads/2019/08/NE-Chapter-of-CHPA-Comments_Mass-Clean-Heat-Standard_8.31.23.pdf
[4] Regulatory Assistance Project. "A Clean Heat Standard for Massachusetts." June 2022. https://www.mass.gov/doc/clean-heat-standard-2-page-summary/download

Respectfully,

2G Energy
Alfa Laval
Batten Consulting, LLC
BROAD U.S.A.
Capstone Green Energy
CarbonQuest
Clarke Energy
Cogen Power Technologies
Combined Heat and Power Alliance
Dalkia Aegis, EDF Group
DT Energy Consultants, LLC
EC Power Inc.
FlexEnergy Solutions
Guascor Energy
Integrated CHP Systems Corp.
INNIO Jenbacher
Kanin Energy
Kinsley Energy Systems
Kraft Power Corporation / Kraft Energy Systems
Lima Company
Martin Energy Group
Mead & Hunt
Northeast Chapter of the CHP Alliance
Northeast-Western Energy Systems
RENEW Energy Partners
Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)
Sterlington Energy Group, LLC
TEDOM USA, Inc.
Vergent Power Solutions

**Mass Clean Heat Standard Framework 2023**

**Comments from Northeast Energy Efficiency and Electrification Council (NEEEC)**

Thank you for the opportunity to provide comments to the Massachusetts Department of Environmental Protection (DEP) on the Clean Heat Standard (CHS) Framework. The proposed CHS framework is a very detailed proposal covering multiple issues and energy providers. The goals and objectives of the Standard are consistent with the state's climate goals and those that many of us have. Overall, NEEEC is supportive of DEP's proposal, however we have several comments to offer to support the deployment of an alternative policy.

Our comments focus on three main areas:

- Ensuring equitable outcomes
- Improving the ability to be implemented
- Considering a simplified alternative approach

**NEEEC stongly encourages MassDEP to ensure this standard appropriately protects environmental and climate justice communities.**

The framework as currently proposed defines equity solely by income, as the full electrification projects in the equity carve-out must serve customers who are eligible for the low-income discount electricity rates. However, not all low-income residents are on low-income rates, and equity can (and should) be broader than just income. Additionally, low-income rate information is private and may not be an accessible data point to allow for a successfully implemented program, as any entity outside of the electric or gas utilities may not be privy to which households should be targeted as part of the equity carve out.

Massachusetts has taken the time to define Environmental Justice Communities as meeting one or more of the following criteria:

> The annual median household income is 65% or less of the statewide annual median household income, minorities make up 40% or more of the population, 25% or more of households identify as speaking English less than "very well", minorities makeup 25% or more of the population and the annual median household income of the municipality in which the neighborhood is located does not exceed 150% of the statewide annual median household income.

Additionally, the federal government, through Justice40, defines Disadvantaged Communities as being in a census tract that meets the threshold for environmental, climate, or other burdens, and an associated socio-economic burden will be marked as disadvantaged. The definitions consider the following categories: climate change, energy, health, housing, legacy pollution, transportation, water and wastewater, and workforce development. With these definitions in mind, and the criteria they encompass, NEEEC requests MassDEP to consider broadening the criteria used to define equity within the MA CHS equity carve-out.

Low-income and equity customers are often sensitive to bill impacts. Building electrification under the current rate structure does not always result in customer bill savings. NEEEC again urges MassDEP to consider ways to protect low income and equity customers from these potential increases in electric bills. Additionally, MassDEP should consider how to create a customer targeting methodology to be proactive in avoiding bill increases. This targeting could be bundled with an initiative for utilities to get more residents on lower rates as well as participate in Mass Save to implement energy efficiency measures to lower use.

**NEEEC flags potential pain points for the implementation of the clean heat standard.**

As NEEEC staff, members, and members of the board represent companies that work day in and day out to implement energy efficiency and decarbonization programs. The current framework for the CHS raises some potential concerns about the practical ability to implement this plan. The key concern is that the standard as presented is very detailed and complex without clear direction of where and how the credits will be monetized, tracked and reported, or allocated. While the overall concept and goals are positive, we are concerned that the coordination of this plan with existing state plans (Mass Save and more) as well as incoming Federal Plans (IRA and Solar for All) is not clearly laid out and could cause uncertainty in the process of management and administration of the many parts of this plan as well as coordination with the many components of the existing State and Federal plans.

NEEEC notes that the incorporation of weather normalization and hybrid heating systems allow for added complexity without clear program benefits, particularly with how it may impact credits. The standard will benefit from regulated entities being able to plan for projects that meet their credit obligation, however the complexities proposed by the framework may jeopardize this.

Additionally, hot water systems should be eligible for some level of credit if they are replacing fossil fuel systems as homes getting heat pump water heaters will benefit not just from the electrification, but also from the improved product efficiency.

**NEEEC proposes a simplified alternative approach for the Commonwealth's consideration.**

We propose to have a much more simplified strategy that addresses climate issues combined with the use of fossil fuels that need to be transitioned. The use of fossil fuels and the market for fossil fuels is extensive across the whole economy. Therefore here is our simplified proposal:

1. Implement a state 5% environmental fee on fossil fuels used in the state. This would include Oil, Propane, Gasoline and Gas. This tax would be collected from consumers by the delivery companies and returned to the state into a special pot of funding.

2. Implement a state-wide electrification discount/special rate reduction of 10% for customers who use electricity for heating and hot water without backup fossil fuel. This would be similar to the current low-income discount rate from a tracking and processing point. The rate application would be based on a report from Mass Save/LEAN assessment that this shift has been carried out.

3. A portion, 50%, of the funds received in the fossil fuel tax would be allocated to fund part of the cost of the electrification discount as well as funding incentives and program support by MassCEC and MassSave to expand the electrification and efficiency delivered to consumers across the state, including municipal light plant customers.

4. In addition, 25% of the fossil fuel tax would be allocated to assisting the workers and companies to transition from the fossil fuel industry. This would be managed by a new advisory board, Fossil Fuel Transition Advisory Board (FFTAB) appointed by the governor. This could include training support for worker transition, changes to corporate strategies that change their business from fossil fuel to either clean energy or alternative economic plans or funding payoffs for the end of a fossil fuel business. The FFTAB would include both representatives from state agencies and members of both clean energy and fossil fuel associations as well as academic or consultant experts.

Hopefully, this plan would achieve similar goals of supporting and incentivizing the shift from fossil fuels to electrification and EE but approached directly and delivered in a consistent manner to the current programs and rate structure. We do realize that in many cases a proposed 'tax' can have a negative reaction from consumers but naming the fee thoughtfully could mitigate that. We believe consumers and policy makers understand that mitigating climate change is a priority.

NEEEC seeks to be an ally to the state to achieve energy efficiency, electrification, and equitable outcomes. Please don't hesitate to contact us with any questions.

Sincerely

Steve Cowell

Executive Director, NEEEC

Steve@cowellconsulting.org

617-816-4826

Directors, NEEEC

December 21, 2023 *Submitted electronically via: climate.strategies@mass.gov*

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

**Re: Massachusetts Clean Heat Standard- Draft Program Framework, November 2023**

Dear Commissioner Heiple and Massachusetts Department of Environmental Protection team,

On behalf of Northeast Energy Efficiency Partnerships (NEEP)[1], I am pleased to submit comments regarding the Draft Program Framework (Framework) for the Massachusetts clean heat standard (CHS). NEEP is a non-profit whose mission is to accelerate regional collaboration to promote advanced energy efficiency and related solutions in homes, buildings, industry, and communities.

We thank the Massachusetts Department of Environmental Protection (MassDEP) for the opportunity to provide input on the Framework. We commend MassDEP for its work so far in developing the CHS and providing many opportunities for public feedback and involvement. The following comments are intended to provide technical assistance and resources relating to the CHS. In addition to these comments, NEEP has tools and resources and is available for direct technical assistance in the implementation of this and future policies.

## Introduction

Massachusetts has taken a momentous step in enacting a clean heat standard (CHS). A CHS sends a signal to regulated (e.g., gas utilities) and unregulated (e.g., heating oil and propane dealers) entities that there will be a transition to a clean building economy. The policy mandates that companies take steps to reduce emissions from heating residences they serve. This encourages regulated entities to shift their businesses over time to clean heat measures.

A CHS operates similarly to renewable portfolio standards (RPS) by setting a performance standard on obligated parties. While an RPS requires parties to deliver a level of renewable power generation, a CHS requires providers of residential HVAC and water heating services to deliver measures that reduce emissions of these appliances.[2]

[1] These comments are offered by NEEP staff and do not necessarily represent the view of the NEEP Board of Directors, sponsors, or partners. NEEP is a 501 (c)(3) non-profit organization that does not lobby or litigate.
[2] States are still deciding the proper ways to distribute clean heat credits. In Vermont obligated parties are all fossil heat providers, including Vermont Gas and Delivered Fuel dealers. As outlined in the framework, Massachusetts may include electric utilities as well.

## *I. Setting the Standards*

*1A. Compliance Obligations for All Regulated Entities*

The Framework proposes the CHS require regulated parties to achieve an equal quantity of GHG emissions reductions of 1 million metric tons (MMT) each year from 2026 through 2050.

NEEP appreciates the commitment to consistent annual state emission standards. However, the state may want to allow for a ramp up period rather than equal annual distribution. A ramp up period would set the first few years at a lower target to allow regulated entities time to identify a compliance pathway for their business. This period may be beneficial for the state because studies have shown that the energy efficiency workforce is not yet ready to deliver programs at the level needed to achieve current state goals. A statewide workforce study found that ninety-two percent of energy efficiency employers reported having difficulty hiring and a lack of knowledge about the industry contributed to the issue. Providing time for the industry to adjust to this new policy can help ensure a continued growth of the industry and future success of the CHS.

*1B. Requirement for "Full Electrification" of Residential Projects and Equity Carve Out*

Full Electrification

The Framework proposes that the CHS accomplish full electrification of 20,000 residences every year.

Creating an annual electrification target sends a clear signal to the market that the CHS will prioritize full electrification. Because the CHS is a market-based policy, creating goals can ensure that the market will reach end results that align with what regulators would like to see. Another example of this type of complementary policy would be creating an appliance standard for heat pump water heaters (HPWH) alongside implementation of a CHS. The appliance standard will drive the market to manufacture HPWHs; as the CHS mandates installers to adopt and utilize this new technology on a more accelerated timeline.

Additionally, NEEP would like to highlight that this goal can serve a similar purpose to the Full Electrification Credits. As the intention of both is to increase the number of fully electrified homes in the state, MassDEP could consider relying on the full electrification goal and removing the additional credit system. NEEP expands on this below.

Equity Carve Out

The Framework proposes an equity carveout which mandates that 25% of the full electrification credits be generated from projects that serve low-income customers and who are eligible for low-income discount electricity rates.

An equity carveout is an important proactive equity initiative. As noted in NEEP's Centering Equity with Metrics Report, these carve outs encourage program implementers to serve LMI communities. Additionally, these goals can ensure, at minimum, an equal amount of benefits flow to LMI communities. NEEP has outlined a few recommendations for MassDEP to consider in establishing this carveout.

- MassDEP can consider increasing the scope of customer eligibility so that it aligns with the state created Disadvantaged Communities definition. The Framework limits customers that can participate in the program and meet the equity carveout to those who are eligible for low-income discount electricity rates. While this achieves the goal of ensuring rates do not increase for these customers, it could also create barriers to participation. For example, customers may not know their eligibility. Also, contractors may not know how to identify these households without accessing private and protected information. MassDEP could consider expanding the carve out to include all households or buildings located in Disadvantaged Communities. These communities encompass a legislatively enacted statewide definition of environmental justice populations and are used to implement numerous programs across the state. Incorporating them here can streamline program delivery and customer engagement across programs.
- NEEP encourages MassDEP to increase the percentage of credits required from LMI communities. This is also in line with the recommendations in the RAP Report on Clean Heat Standards for Massachusetts. In the report, RAP recommends that in designing the program the state should focus on energy-burdened households by requiring a high fraction of all credits earned to be sourced from services provided to low-income households. The report recommends a carve out of at least 33% to those with the highest need in the state, plus an additional 33% be delivered to moderate-income residents for at least the first 4 – 5 years of program operation.

*1C. Clean Heat Standard as an Umbrella Building Decarbonization Program*

The Framework proposes that the CHS would be inclusive of clean heat measures supported by other programs, such as federal tax credits and Mass Save programs.

NEEP agrees with this recommendation. Using the CHS as an umbrella policy for state climate goals ensures accountability and achievement of state goals as the CHS can track all state and local actions. This collective program can ensure there is adequate progress while also working to advance similar policy goals. California has a similar statewide policy through the cap and trade program. The program operates to track 85% of emissions in the state and regulates about 450 entities, including electricity generators, large industrial facilities, and fuel distributors who deliver gas for transportation, natural gas, and propane.

## *II. Regulating Heating Energy Suppliers*

The Framework would require retail sellers of natural gas, heating oil, propane, and electricity to demonstrate compliance each year.

*2A. Requirements on Electric Utilities*

The Framework proposes that requirements for electricity sellers would be set in line with current building electrification programs (energy efficiency plans) in the early years of implementation, and then increase gradually to ensure long-term viability of the standard as fuel providers' customer base declines.

- For Full Electrification Credits, initially compliance would be set to match mandates in the state energy efficiency plans. Between 2030 and 2040, the amount of credits will increase to align more with state goals. In 2040, the credit requirement would grow to ensure that full electrification is happening at the pace needed to achieve state goals.
- For Emissions Reduction Credits, the obligation would phase in after 2030, increasing in 2040, similar to the full electrification credits.

Aligning goals with Mass Save in the initial phase of the CHS will provide a streamlined way for electric utilities to participate. NEEP would like to caution MassDEP as they design the CHS to ensure it provides clear pathways for the delivered fuel industry to achieve emissions reductions, consistent with the CHS's intent to trigger long-term market transformation in the delivered fuel industry. This is important because delivered fuels are not regulated and emit a significant portion of emissions. If the state chooses to regulate both electric utilities and fuel dealers, this will mean that fuel dealers will be competing with utilities to generate their credits. This can create a unique advantage for electric utilities because they have mature programs and have been investing in this transition for years. As noted in a RAP Whitepaper for Vermont on the CHS, "simply mandating a huge expansion of the electric utility [program] would not give [fuel dealers] the incentive to retarget their businesses for the future." Depending on how the state would like to leverage the CHS, this could create issues in market transition.

Vermont has identified market transformation of the fuel industry as one of the priorities of their CHS and has so far kept electric utilities out of their regulatory framework. Vermont has identified the use of a third-party delivery agent such as Efficiency Vermont. The third-party administrator would be acting on behalf of the fuel dealers in delivering credits not generating credits for itself to use.

## *III. Credit Generation*

### *3A. Full Electrification Credits and Emission Reduction Credits*

The Framework Proposes two types of credits with two types of standards: (1) Emission Reduction Credits, available to all three types of measures contemplated by the program and (2) Full Electrification Credits that mandate full conversion of residences. The Full Electrification Credits earn a standard set of emissions, regardless of their actual reduction. To earn these credits, the obligated party must install of heat pumps capable of meeting 100% of the space heating needs of residence and remove all combustion space heating equipment or have the homeowners agree to reduce the use of the equipment.

NEEP encourages MassDEP to consider using only one type of credit for accounting of emissions reductions. Creating one line of credits and adjusting the amount of credits each measure receives based on actual GHG reductions can avoid confusion in implementation and ensure proper accounting. The CHS will be an umbrella policy to track achievement of state-wide emissions reductions, agnostic to the program implementer. Therefore it is important that in tracking reductions, the CHS uses methodologies that are standardized where possible. Using two types of credits can make it more difficult to account for emission reductions and recognize what measures are creating the most success. To ensure that full electrification occurs and other state policy priorities are met, MassDEP can use the equity carve out and full electrification goal already in the program.

*3B. Exclusion of Weatherization and Energy Efficiency Measures to Allow Mass Save to Serve that Market*

The Framework proposes that the following measures earn credits:

- Full electrification projects that meet the requirements for early action crediting would receive Full Electrification Credits on installation and Emission Reduction Credits annually beginning the first year of operation.
- Hybrid systems that retain fossil backup would be eligible for annual Emission Reduction Credits based on evidence of utilization for heating, such as electricity billing records showing a winter-peaking pattern.
- Documented delivery of eligible liquid biofuels would earn annual Emission Reduction Credits toward compliance obligations of heating oil suppliers.

NEEP encourages MassDEP to include additional measures such as weatherization and water heaters in the CHS standard. Massachusetts has made it a priority to combine weatherization with HVAC replacement, as evidenced by the Mass Save program incentives and mandates to combine weatherization with heat pumps. Whether or not weatherization is eligible to generate credits, it will be important that contractors are incentivized to offer weatherization measures alongside the home electrification measures within CHS to align with state policy. Including weatherization measures could make it easier to incentivize contractors to offer both as they will be equally eligible for credits. Further, this Framework could exclude water heaters from the program and these appliances often run off the same fuel as HVAC systems, so replacing both at once could streamline programs and help customers make a full decarbonization transition.

In Vermont, legislation enacting the Clean Heat Standard includes a multitude of measures because Vermont wants to drive building decarbonization through both weatherization and electrification of appliances. These measures include weatherization, heat pumps, heat pump water heaters, utility-controlled electric water heaters, district heating services, manufactured homes, and others. To include weatherization in the program, MassDEP could make it so that weatherization could be reported in a similar way to heat pump installs for utilities regulated by both Mass Save and the CHS. This would mean less work to include these measures in the CHS program as MassDEP could use similar reporting and accounting mechanisms to Mass Save.

*3C. Emission Crediting Framework*

The Framework proposes a standard crediting system in which:

- Substituting clean heat for combustion in a single residence will be credited 5 MT per year, regardless of the size of the residence or whether it was single family home or apartment. MassDEP acknowledges that 5 MT is a rough estimate of the fossil fuel emissions resulting from heating a typical Massachusetts residence, and that larger residences normally emit more than 5 MT per year.

- Systems that do not meet the full load but are "used for heating" will be credited 2.5 MT per year
- Non-Residential Commercial Projects will receive credit based on demonstration of reductions, consistent with established methods used by the Massachusetts Department of Energy Resources (DOER) or MassDEP's greenhouse gas emissions reporting regulation for facilities.
- Eligible liquid biofuels would be credited based on the avoidance of all emissions from combustion of an equivalent quantity of heating oil. Other biofuels would receive half credit through 2030 only.

These measures will all earn annual emission reduction credits, with full electrification projects having the opportunity to earn both types of credits available.

NEEP recommends MassDEP reconsider using a flat rate for electric conversions. A flat rate may benefit smaller projects, but it could deter conversion in larger homes because there is a credit cut off. Additionally, CHS will be an umbrella policy which means it will act to account for all actions, a flat number where exact data could be used might be problematic in accounting emissions reductions. If MassDEP decides to adjust its accounting, there are programs in Massachusetts and neighboring states that could be used to identify reductions in emissions from whole home electrification, such as the state Alternative Portfolio Standard Program, Mass Save and Vermont Clean Heat Standard. If MassDEP would like to use the flat rate to provide a benefit to smaller homes, it could consider adjusting the rate upwards only, so to accommodate larger projects.

*3D. Ownership of Credits*

The Framework proposes that for electrification projects, ownership of credits would be granted to the property owner. For blended fuels, credits will be assigned to the company delivering the fuel.

NEEP recommends considering making the process the same for ownership of credits no matter the project. The Framework proposes that electrification credits go to property owners with the assumption the owner will assign the credits to the installer. Conversely, for blended fuels, the obligated entities would receive credits upon delivering the fuel or measure to the property owner. This creates different frameworks for electrification and blended fuels products. For parties that deliver the electrification measures, they will have an extra step of ensuring the customer transfers the credits to them, whereas if a blended fuel measure is delivered the obligated party will automatically receive the credit.

NEEP encourages MassDEP to design the CHS so that a party that is obligated to deliver the measures through the CHS receives the credit initially. This will make it equal for parties to earn credits no matter the measure delivered and could avoid confusion in the market if customers are not sure how to assign their credit. It can also reduce uncertainty that would arise if customers attempt to keep their credit. A report on the CHS from the Regulatory Assistance Project highlights that obligated parties can be the ones to receive the credits initially as they generate the credits directly.

## Conclusion

Massachusetts' Clean Heat Standard shows national leadership in building decarbonization. These comments are intended to support the work currently underway with the CHS, and we appreciate the opportunity to provide input. In addition to these comments, NEEP is available to provide technical assistance and assist MassDEP in furthering its decarbonization goals.

Sincerely,

Erin Cosgrove

Erin Cosgrove, Esq.
Senior Manager, Policy and Programs
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Ecosgrove@neep.org

**Northeast Hearth, Patio, and Barbecue Association**
PO Box 28, Sudbury, MA 01776 . 978-440-0344 . nehpba.org

**December 19, 2023**

By email to: climate.strategies@mass.gov

RE: Clean Heat Standard draft program framework – Comments and Request for extension of December 21 deadline

To whom it may concern:

My name is Karen Arpino and I am writing on behalf of The Northeast Hearth, Patio & Barbecue Association. The Northeast Hearth, Patio & Barbecue Association (NEHPBA) is a trade association representing more than 300 individual member hearth and fireplace retail and related companies throughout the Northeast. Specifically, in the Commonwealth of Massachusetts, we have over 60 member companies supporting 350 families. The vast majority of our members are independent "mom and pop" small businesses that play a large role in the communities and markets they serve across the Commonwealth.

We request that the Department of Environmental Protection (DEP) extend the comment period for the Clean Heat Standard (CHS) draft program framework ("the draft framework") for an additional sixty days, from the current December 21, 2023, deadline to February 21, 2024. The draft framework was publicly released on November 16, 2023, just a few days before Thanksgiving and the comment period coincides with the holiday season.

We are committed to addressing the climate crisis and aspire to be a valuable and reasonable partner in this important rulemaking in the months ahead. An extension should not unnecessarily delay the implementation of a CHS but rather result in more input and understanding that will enable all parties to get it right.

Although this proposal is a draft framework and not rulemaking, it's bound to mold the scope of the final rule. The draft framework proposes the establishment of an enormous new market impact program that would set very ambitious electrification goals, especially for residential housing. The proposed program would assess new compliance obligation payments on all energy providers which will be passed on to homeowners and businesses and impact the Commonwealth's ambitious housing goals. These cost increases will likely far exceed those associated with the volatility spikes we have experienced over the last several cold seasons.

While our members strongly support climate action, forcing Massachusetts residents to phase out and replace their gas fireplace products and heating equipment by increasing the cost of fuel does more harm than good. In addition to driving up the cost in the short term of operating Gas Fireplaces as an essential backup heat source, the Clean Heat Standard would devastate the locally owned and operated fireplace retailers in the Commonwealth.

Please consider our comments below:

- It will be vital to quantify the magnitude of the new costs that will ultimately be passed on to builders and end users. Market predictability is vital to the production of new housing and commercial development. As proposed we believe the scale of this program will severely disrupt existing and future building activity.

- This plan is essentially a tax on all Massachusetts residents without the assurance of emission reductions. The CHS completely ignores the carbon intensity of electricity generation from the grid while simultaneously excluding biomass, which qualifies for a federal tax credit in the Inflation Reduction Act.

- The CHS draft framework states that "standards would be inclusive of clean heat supported by other programs, such as federal tax credits." We agree with these inclusive standards. The federal Biomass Tax Credit, included in the Inflation Reduction Act, strengthens our case that biomass should be included in the Clean Heat Standard. This type of forced electrification jeopardizes businesses and residents' ability to choose affordable, reliable heating.

- We are disappointed that the framework does not contemplate the incentivization of building sectors' decarbonization pathways like biogas and hydrogen. The framework acknowledges the valuable decarbonization reductions associated with scaling the use of biofuels as they avoid direct methane emissions into the atmosphere that would otherwise occur. Biogas works the same way and since it would utilize existing pipe infrastructure rather than truck deliveries it will avoid new transportation sector emissions and scale faster. Hydrogen yields zero emissions and also has the potential to yield large-scale and swift emissions reductions to large industrial energy users.

- This standard is hostile to any heating equipment except for heat pumps, severely limiting the installation of hearth products. We are disappointed to see that biomass is not considered for credit generation. Wood and pellet heating can help supplant the use of fossil fuels.

- Page two of the draft says that "standards would be inclusive of clean heat supported by other programs, such as federal tax credits." We agree with that statement and point to the federal Biomass Tax Credit which was included in the Inflation Reduction Act, strengthening our case that biomass should be included.

- Finally, our read of the framework suggests that the new CHS program aims for a zero emissions building sector in the Commonwealth by 2050 rather than a net zero of the 1990 emissions level as established by law. We cannot stress enough that such a departure from existing law in the building sector in a place like New England will be seen as not just heavy-handed but unachievable. We fear setting forth such an ambitious objective will not establish the market buy the Department seeks but rather widespread opposition and controversy hindering progress, small business, construction and the implementation of achievable objectives.

In your capacity, and as representatives of Massachusetts, please think about the impact of the CHS on small businesses, jobs, Massachusetts residents, and consumer choice. Thank you for your consideration of our comments. Please do not hesitate to contact me at (978) 443-0344 or via email at Karen@NEHPBA.org with any questions.

Sincerely,

Karen L Arpino

Karen Arpino
Executive Director
Northeast HPBA

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December 21, 2023

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

Submitted Via Email: climate.strategies@mass.gov

## Oberon Fuels Comments on Draft Framework for Clean Heat Standard

We are strongly in support of Massachusetts implementing a Clean Heat Standard and applaud the Department for the progress made to date. However, we have strong reservations about the draft proposal and recommend further stakeholder engagement to develop a workable rule.

### Background

Oberon Fuels, Inc. is an innovative company founded 13 years ago with a focus on decarbonizing the global LPG/propane industry while laying the foundation for renewable hydrogen. We accomplish this by producing renewable dimethyl ether (DME). DME can be made from upgrading biomethane from various organic waste streams (*e.g.*, agricultural and food waste such as manure) and can reduce the carbon footprint of transportation fuels when used as 1) a blending agent with LPG/propane; 2) a hydrogen carrier to power the growing fuel-cell electric vehicle market, or 3) a diesel substitute.

### About DME

Because DME handles like LPG, it requires minimal modifications to the existing, expansive, global LPG distribution network and leverages the expertise of its existing workforce. The molecular structure of DME results in zero particulate matter (PM) emissions even when directly combusted. When produced from renewable feedstocks, use of DME can result in an 85%-101% reduction in lifecycle GHG emissions compared to conventional diesel fuel, as estimated by Argonne National Lab.[1]

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[1] Lee, Uisung et al. (2016). Well-to-Wheels Emissions of Greenhouse Gases and Air Pollutants of Dimethyl Ether from Natural Gas and Renewable Feedstocks in Comparison with Petroleum Gasoline and Diesel in the United States and Europe. SAE International Journal of Fuels and Lubricants. 9. 10.4271/2016-01-2209.

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While DME can be made from various renewable sources, Oberon is focused on using organic wastes as a feedstock. The technology pathway involves anaerobically digesting the waste to produce raw biogas. Oberon upgrades the raw biogas into syngas then converts the syngas into methanol and catalytically distills the methanol into DME. Unlike a biogas-RNG process, we can use all the $CO_2$ present in the raw biogas as feedstock for the finished fuel.

Our partner, Suburban Propane, is blending Oberon's rDME® fuel into conventional propane for use in forklifts in the Anaheim region of southern California.

While the first commercial entry to the US fuel market for rDME® is blending into propane to reduce its carbon intensity in existing California Low Carbon Fuel Standard-eligible applications such as forklifts, there are other fuel applications such as those in home heating that could benefit from DME/propane blends. There are also many niche markets where DME's zero-soot clean burning properties are a value-add benefit, such as providing heat, power, and a clean $CO_2$ exhaust to greenhouses and grow houses. Applications for DME include:

DME/Propane blends:

- In agriculture including tractors, irrigation engines, heaters, frost protection/wind machines (mobile and semi-mobile)
- In power generation applications
- In entertainment and leisure, including small propane cylinder use for portable heaters and barbeques
- In residential and commercial applications such as cooking and home heat

Pure DME:

- Diesel replacement for vehicles, generators, engines, and heaters
- Propane replacement for vehicles, generators, engines, and heaters

## DME Application in a Clean Heat Standard

Ideas are needed to help Massachusetts meet its ambitious GHG reduction targets. The propane industry is actively developing new technologies to support decarbonization. Renewable propane and renewable DME can both be blended seamlessly into the existing propane infrastructure to provide consumers with clean-burning, low carbon or carbon-negative fuel.

Public policy works best when all stakeholders are aligned and stand to benefit from anticipated outcomes. Our collective goal should be to enable the propane industry to participate in the energy transition, maintain the jobs and livelihoods of its workers, and support its customers by delivering reliable energy.

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We must do this in a way that aligns with the goals of the State to reduce greenhouse gas emissions and criteria pollutants, to increase economic growth, and increase energy security (and with it, price and market stability). A Clean Heat Standard can achieve these goals with the application of two key principles: *technology neutrality* and *performance based crediting*.

***Technology neutrality***

Technology neutrality means that program design should not pre-judge or restrict the potential use of a feedstock or fuel that may support the overall objective of the Clean Heat Standard. For all the various forms of residential and commercial heating there are many current, developing, and unknown future technology options. Program design should be as flexible and inclusive as possible to enable the market to find the fastest, most cost-effective options. Any restrictions that may be established in program's founding regulations should be given extra attention in the public process. At risk is the ability of the market to provide credit-generating products at competitive costs, and thus the real success or failure of the program.

***Performance based crediting***

The program should operate on a performance basis. Reduction of greenhouse gas emissions is the only relevant metric within the other boundaries of the program. California's Low Carbon Fuel Standard (LCFS) has proven the success of a technology-neutral performance-based system. With over a thousand unique feedstock-facility-fuel combinations, the flexibility of the LCFS has enabled a wide array of low carbon and carbon negative fuels to blend with, substitute for, or replace fossil fuels such as gasoline, diesel, natural gas, propane, jet fuel, and grid power. The science of lifecycle analysis is well established and provides a level playing field for all technologies to compete.

**Framework Comments**

> *Item 3.F.4. Eligible waste-based liquid biofuels would be credited based on the assumed avoidance of all emissions from combustion of an equivalent quantity of heating oil. Other liquid biofuels eligible for the federal Renewable Fuel Standard would receive half credit through 2030 only.* [viii]
>
> [viii] *The Massachusetts Alternative Portfolio Standard program currently limits eligibility to waste-based biofuels. Discounting or limiting crediting for other biofuels would be consistent with this precedent and with US EPA analysis of indirect emissions from biofuel production. Biofuel eligibility would be reconsidered in the 2028 program review.*

**Comment on 3.F.4.**

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The proposed policy in 3.F.4. is confusing and counterproductive to the goals of the Clean Heat Standard. Let's take a look at each part of this section.

*"Eligible waste-based liquid biofuels":* This term is not defined, but footnote [VII] suggests that the proposal intends to limit eligible biofuels to waste-based liquids to harmonize with the Massachusetts Alternative Portfolio Standard. From first principles there is no reason to restrict eligible biofuels to be either only waste-based or only liquid. There are waste biomass feedstocks that are not included in the RFS and non-waste biomass based fuels that can be carbon negative, performing on a lifecycle emissions basis better than conventional renewable diesel or other alternatives. Making regulatory determinations about what are and are not waste products is in fact extremely challenging and current definitions vary considerably by jurisdiction. The federal RFS applies entirely different categorizations to RIN generating fuels (e.g. renewable, biomass based diesel, advanced, cellulosic). Cellulosic fuels may even be derived from planted energy crops, not wastes. This is in contradiction to the Clean Heat Standard proposal footnote [VII] that suggests *"Discounting or limiting crediting for other biofuels would be consistent with this precedent and with US EPA analysis of indirect emissions from biofuel production."* If DEP's concern is the impact of indirect land use, then we strongly suggest applying a uniform life-cycle assessment determination for eligible fuels that is tied to a performance target and not an arbitrary demarcation.

The Massachusetts Alternative Portfolio Standard (APS) itself is not limited to waste only (just the liquid biofuel definition), and harmonization is not an inherent public good if it increases costs and reduces program effectiveness. If a tie to APS is important, why not be inclusive of APS Eligible Biomass Fuel generally, or Eligible Biogas Fuel, with an update clarification for other upgraded products beside RNG?

The limitation to liquid fuels is even more baffling given the significance of heating fuels such as natural gas and propane and their related infrastructure in Massachusetts . Current low-carbon alternatives exist today that can be delivered to consumers without switching costs in the form of readily available pipeline-injected renewable natural gas (RNG) and renewable propane and renewable DME both of which can be used in liquid or gaseous form. Furthermore, these three fuels are almost exclusively made from wastes and are eligible advanced and cellulosic biofuels under the federal Renewable Fuel Standard.

The principle of technology neutrality suggests that instead of "waste-based liquid biofuels", eligible biofuels should be those that reduce greenhouse gas emissions and that can be shown to displace fossil fuel use in heating by consumers.

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*"credited based on the assumed avoidance of all emissions from combustion of an equivalent quantity of heating oil":* This clause also introduces regulatory discrimination at odds with the purpose of the Clean Heat Standard. It would reward equally all fuels regardless of actual lifecycle emissions performance. For example consider renewable diesel. Under the California LCFS there are 136 renewable diesel pathways ranging in carbon intensity from 15.64 $gCO_2e/MJ$ to 80.81 $gCO_2e/MJ$ and within that the range the subset for waste fats renewable diesel is 15.64 $gCO_2e/MJ$ to 51.9 $gCO_2e/MJ$. Renewable natural gas carbon intensities can be deeply negative, as low as -532.74 $gCO_2e/MJ$. These are producing different environmental outcomes that are both scientifically verifiable and that result in different economics from other clean fuel incentives. The different economics and scaled benefits are reflected by programs such as the California, Washington, and Oregon Low Carbon Fuel Standards and the federal tax credits 45V and 45Z which are scaled based on carbon intensity.

*"Other liquid biofuels eligible for the federal Renewable Fuel Standard would receive half credit through 2030 only":* We question the rationale for this provision and struggle to understand why this contorted connection to the RFS is being made rather full harmonization with the RFS, alignment with other state models, or a fully built-for-purpose Massachusetts program. Again we search for the logic of separating waste eligible liquid biofuels from other liquid biofuels and the logic of excluding non-waste liquids and waste-based gaseous fuels, and the ambiguity around liquid gases such as propane and DME). In addition, the provision for half-credit doesn't make sense considering the range of carbon intensities for 'other liquid biofuels eligible for the federal Renewable Fuel Standard' which can include conventional ethanol plants that have carbon intensities equivalent to gasoline or propane.

**Conclusion**

Oberon believes that allowing credit for reducing carbon intensity while using in-service equipment will help facilitate quicker emissions reductions, fossil fuel displacement, and market transformation. Taking opportunities to leverage existing infrastructure reduces costs, speeds uptake, and supports workforce transition.

We look forward to working with you to reduce emissions, create low-carbon or carbon-negative fuels, and create good-paying jobs. Please do not hesitate to contact me at david.mann@oberonfuels.com or 858-867-3591 if we can be of any assistance.

Sincerely,

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David Mann

David Mann
VP, External Affairs
Oberon Fuels

December 21, 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 Draft Framework**

Dear Commissioner Heiple,

The Partnership for Policy Integrity (PFPI) appreciates the opportunity to comment on the draft framework for Massachusetts' Clean Heat Standard (CHS) program. The following comments supplement the joint comments submitted by Conservation Law Foundation *et al.,* which PFPI signed on to.

We continue to recommend that MA DEP limit program eligibility to non-combustion technologies and measures. While we were pleased to see that the draft framework does not envision allowing solid biomass to qualify at this time, we are concerned about the potentially expansive scope of eligibility for liquid biofuels set forth in the framework. The framework states that "[e]ligible waste-based liquid biofuels would be credited based on the *assumed avoidance of all emissions from combustion of an equivalent quantity of heating oil*" (emphasis added). First, this assumption is not supported with scientific evidence and could end up creating perverse incentives for waste-based liquid biofuels that are significantly more polluting than the fossil fuels they are displacing. Second, it creates a problematic precedent that could be carried over into subsequent program reviews and applied to *all* biogenic fuels, including solid biomass.

It is important to note that eligible biomass fuels under the Alternative Energy Portfolio Standard ("APS") program are *not* assumed to be zero emission. The APS statute requires that eligible biomass, biogas and liquid biofuel technologies must achieve a "50 per cent reduction in life-cycle greenhouse gas emissions compared to a high efficiency unit utilizing the fuel that is being displaced."[1] In addition to carbon emissions, the APS statute recognizes that combustion of biomass, biogas and liquid biofuels emits conventional air pollutants, including $PM_{2.5}$, carbon monoxide, and other air pollutants that are harmful to human health. To address this, the APS requires emissions performance standards that are protective of public health and limits eligibility only to best-in-class commercially feasible heating technologies.

[1] MGL Chapter 25A, Section 11 F1/2

While there may be certain waste feedstocks that can be used to produce liquid biofuels that meet the requirements of the APS statute, we believe that the provisions set forth in DOER's *Guideline on Biomass, Biogas, and Biofuels for Eligible Renewable Thermal Generation Units* are insufficient to ensure that the fuel reduces lifecycle greenhouse gas emissions by at least 50% when compared to the fuel being displaced. A proper assessment of lifecycle emissions from biogenic fuels should include the $CO_2$ emissions from combustion of the fuel itself.[2] At a minimum, the CHS program should expressly exclude any liquid biofuels derived from wood, wood waste or mixed municipal solid waste due to their carbon intensity.

Thank you for this opportunity to comment.

Sincerely,

Katy Eiseman
Policy Advisor
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Laura Haight
U.S. Policy Director
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Attachment

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[2] Mary S. Booth, Not carbon neutral: Assessing the net emissions impact of residues burned for bioenergy. *Environmental Research Letters*, Feb. 21, 2018, at https://iopscience.iop.org/article/10.1088/1748-9326/aaac88.

# Not carbon neutral: Assessing the net emissions impact of residues burned for bioenergy

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LETTER

# Not carbon neutral: Assessing the net emissions impact of residues burned for bioenergy

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Keywords: bioenergy, wood pellets, climate mitigation, residues, biomass, forest residues, carbon accounting

## Abstract

Climate mitigation requires emissions to peak then decline within two decades, but many mitigation models include 100 EJ or more of bioenergy, ignoring emissions from biomass oxidation. Treatment of bioenergy as 'low carbon' or carbon neutral often assumes fuels are agricultural or forestry residues that will decompose and emit $CO_2$ if not burned for energy. However, for 'low carbon' assumptions about residues to be reasonable, two conditions must be met: biomass must genuinely be material left over from some other process; and cumulative net emissions, the additional $CO_2$ emitted by burning biomass compared to its alternative fate, must be low or negligible in a timeframe meaningful for climate mitigation. This study assesses biomass use and net emissions from the US bioenergy and wood pellet manufacturing sectors. It defines the ratio of cumulative net emissions to combustion, manufacturing and transport emissions as the net emissions impact (NEI), and evaluates the NEI at year 10 and beyond for a variety of scenarios. The analysis indicates the US industrial bioenergy sector mostly burns black liquor and has an NEI of 20% at year 10, while the NEI for plants burning forest residues ranges from 41%–95%. Wood pellets have a NEI of 55%–79% at year 10, with net $CO_2$ emissions of 14–20 tonnes for every tonne of pellets; by year 40, the NEI is 26%–54%. Net emissions may be ten times higher at year 40 if whole trees are harvested for feedstock. Projected global pellet use would generate around 1% of world bioenergy with cumulative net emissions of 2 Gt of $CO_2$ by 2050. Using the NEI to weight biogenic $CO_2$ for inclusion in carbon trading programs and to qualify bioenergy for renewable energy subsidies would reduce emissions more effectively than the current assumption of carbon neutrality.

## Introduction

Meeting the Paris Agreement goal of limiting global temperature increase will require fast deployment of zero-emissions energy and greatly increased carbon sequestration. In developing pathways to limit atmospheric $CO_2$, many climate mitigation models include a doubling or more of bioenergy to at least 100 EJ in the coming decades [1–3], with much of the fuel assumed to come from forestry and agricultural residues [3]. Though oxidizing 100 EJ of biomass would emit about 9 Gt of $CO_2$ each year, most mitigation models assign bioenergy zero net emissions.

The assumption of bioenergy carbon neutrality underpins many renewable energy investments, including in the EU, UK and Asia where dried wood pellets are imported as a replacement for coal. Such policies, and the lucrative subsidies they provide, have driven rapid growth in the wood pellet sector in North America, with US exports growing from less than 0.1 Mt in 2008 [4] to 4.9 Mt in 2016 [5]. Canadian pellet exports increased 46% from 2015–2016 [6], and US pellet exports are projected to double or triple from 2016 levels by 2025 [5, 7].

Biomass power plants tend to emit more $CO_2$ than fossil fueled plants per MWh, and as shown by a number of studies, net emissions from bioenergy can exceed emissions from fossil fuels for decades [8–12]. Nevertheless, some studies conclude rapid carbon benefits from burning wood pellets by employing various assumptions: that forest planting will increase in response to demand for wood [13]; that replanting occurs immediately after harvest [14]; or that forest growth elsewhere compensates for emissions from harvesting and combusting trees [15, 16] (for a review, see Ter-Mikaelian *et al* 2015 [17]). Some discussions of bioenergy in mitigation modeling include similar assumptions that burning 'sustainable,' 'optimal' [1, 3] or 'surplus' [18] forest wood can reduce net $CO_2$ emissions as long as forest carbon stocks are increasing. Such assumptions often disregard the role of the forest carbon sink, thus the controversy around bioenergy carbon accounting continues.

However, on one aspect of bioenergy carbon accounting there is wide agreement: that when biomass is sourced from residues from forestry, wood products manufacturing, or agriculture, net carbon emissions are properly assessed as the difference between emissions from their use as fuel (which can include emissions from fuel manufacturing and transport), and emissions from an alternative fate, such as leaving material on-site to decompose or burning it without energy recovery [8–10, 12 19–23].

Studies using this approach generally conclude net bioenergy emissions are not zero over varying periods of time. Nonetheless, many policies still treat bioenergy as having zero or negligible emissions. European Commission guidance for the EU carbon trading program explains bioenergy emissions should be 'taken to be zero,' and that wood pellets consist of 'processing residues from forest based industries' [24]. The IPCC acknowledges harvesting trees for fuel can increase cumulative emissions for years to centuries, but concludes that 'agricultural and forestry residues can provide low-carbon and low-cost feedstock for bioenergy' [3]. The IPCC renewable energy report identifies potential for 100 EJ of bioenergy specifically from residues [18] and does not discuss potential emissions.

For the assumption that residues have negligible net emissions to be reasonable, at least two conditions must be met. First, biomass classified as residues must actually be residues—that is, materials generated by some other process, where the alternative fate is decomposition or burning without energy recovery. Second, net emissions from bioenergy, that is, the cumulative additional $CO_2$ emitted from processing and burning biomass versus from an alternative fate, must be low, if not negligible, within a timeframe meaningful for climate mitigation.

What should 'low net emissions in a meaningful timeframe' mean? Most scenarios for climate change mitigation that constrain temperature rise consistent with Paris Agreement goals require emissions to peak between 2020 and 2030 and decline to less than half 2010 levels by 2050 [25], with negative emissions shortly thereafter. Actions that reduce or end emissions in the next ten years are thus essential, given that elevated $CO_2$ is already driving essentially irreversible polar ice loss, permafrost melting, and ocean acidification, along with thermal sea-level rise, which has been shown to respond to temperature changes from short-lived climate pollutants in a ten-year timeframe [26].

Here, 'low net emissions' from bioenergy implies a comparison to gross or 'direct' emissions from manufacturing and burning biomass. This study uses a simple model to calculate a new metric, the 'net emissions impact' (NEI), which is the ratio of cumulative net emissions to direct emissions from burning residues for energy. The NEI expresses the proportion of direct $CO_2$ emissions that contributes an additional warming effect over a fifty-year period. Fuel and feedstock use, net emissions and the NEI are calculated for three main case studies: the existing US bioenergy sector, new wood-burning plants using chipped wood, and wood pellets that are exported to the EU to be burned as a replacement for coal.

## Approach

Built in Excel, the model calculates cumulative net emissions as cumulative direct emissions ($CO_2$ from combustion for energy plus $CO_2$ from harvesting, producing, and transporting biomass, or 'HPT emissions'), minus cumulative counterfactual emissions (what emissions would be if the biomass were left in the field to decompose or were burned without energy recovery). The net emissions impact (NEI) is the ratio of cumulative net emissions to cumulative direct emissions.

HPT emissions are calculated as explained below. Direct combustion emissions are calculated as joules of heat input for each fuel multiplied by fuel-specific $CO_2$ emission factors [27] (non-$CO_2$ greenhouse gas emissions are not included in this version of the model). The spreadsheet sums cumulative counterfactual emissions from biomass collected in each year in columns, then sums across columns to calculate cumulative emissions by each year from all biomass collections up to and including that year.

Counterfactual carbon emissions (with conversion to $CO_2$ at the last step) are calculated as:

$$\mathrm{PE}'(t) = 1 - (e^{-k't}) \quad (1)$$

$$\mathrm{cE}'(t) = \mathrm{BC}' * \mathrm{PE}'(t) \quad (2)$$

$$\mathrm{CE}(t) = \sum_{1}^{t} \mathrm{cE}'(t) \quad (3)$$

where

$\mathrm{PE}'(t)$ = proportion of carbon from biomass collected in a given year that has been emitted by year $t$

$k'$ = rate-constant for decomposition of biomass collected in a given year

$\mathrm{cE}'(t)$ = carbon from biomass collected in a given year that has been emitted by year $t$

$\mathrm{BC}'$ = carbon content of biomass collected in a given year

$\mathrm{CE}(t)$ = carbon emitted by year $t$ from biomass collected in all years

**Table 1.** Model inputs for biomass burned for energy in the US. Heat input is average summed value per year for the industrial and non-industrial sectors, 2001–2016. See text for details.

| Fuel | GJ $yr^{-1}$ | $CO_2$ EF | HPT factor | Alternative fate | k |
|---|---|---|---|---|---|
| **Agricultural biomass** | 31.7 | 0.101 | 7.5% | Decomposition | 0.65 |
| This constitutes a small percentage of biomass burned in the US, but can represent a large variety of materials, including crop stover, nut hulls, and sugarcane bagasse. The *k*-constant produces a half-life for residues of one year. | | | | | |
| **Black liquor** | 800.5 | 0.087 | — | Burn w/o ER | — |
| This is a high moisture content material left residue of pulp- and paper-making. The model assumes no net emissions from burning it for energy. | | | | | |
| **Other biomass solids** | 18.3 | 0.101 | 4% | Burn w/o ER | — |
| EIA does not specify what these materials are. While there are likely processing costs, the model assumes a minimal 4% HPT emissions to be conservative. | | | | | |
| **Sludge waste** | 6.3 | 0.072 | — | Burn w/o ER | — |
| Sludge waste is another residue of pulp- and paper-making. | | | | | |
| **Wood liquor** | 11.3 | 0.072 | — | Burn w/o ER | — |
| This material is related to black liquor. | | | | | |
| **Wood solids** | 548.8 | 0.081 | 4% | Decomposition | 0.083 |
| This includes forestry wood, mill residues, urban tree trimmings, and construction and demolition wood. For consistency with wood pellet scenarios below, the *k*-constant is 0.083. | | | | | |

To evaluate emissions from the US bioenergy industry, the model uses bioenergy data from the Energy Information Administration (EIA) for 2001–2016 [28] and $CO_2$ combustion emission factors used by the US Environmental Protection Agency (EPA) for power sector modeling (original units short tons mmbtu$^{-1}$; converted here to metric tonnes GJ$^{-1}$) [27]. Alternative fate emissions are calculated using *k*-constants particular to each fuel (table 1).

The model includes HPT emissions for forestry residues and other wood as equivalent to 4% of the carbon content of green chips, based on Domke *et al* (2012) and reviews of other studies [9, 29]. The model assumes the alternative fate for agricultural residues is decomposition, as crop burning occurs on less than 1% of agricultural acres in the US [30]. Selecting an HPT factor for agricultural residues is not straightforward, as emissions from harvest, transport, shredding, baling, and sometimes pelletizing can be significant. Depending on how system boundaries are drawn, emissions from crop cultivation, including $N_2O$ from fertilizers, can be ascribed to residues [31]. Storage also imposes lifecycle emissions because agricultural materials can only be collected at fixed intervals. Most importantly, removing agricultural residues can deplete soil carbon [32]; some estimates of total HPT emissions including soil C loss sum to more than 100% of fuel carbon content [31]. This model used an HPT factor of 7.5% for agricultural residues based solely on harvest and transport estimates for corn stover in Whitman *et al* (2011) and did not include soil carbon impacts because this factor was not included for forestry residues. As agricultural residues provided a small percentage of total fuels, the choice of HPT factor had only a trace effect, but any study of large-scale use of agricultural residues should include soil carbon effects.

Data on wood use by the US pellet manufacturing sector was obtained from the forest-industry tracking company Forisk [33]. Five pellet scenarios were modeled to examine how the *k*-constant and changing use through time affect net emissions (details in table 2). Scenarios 1–4 estimated HPT emissions (which include harvesting, transport to plant, debarking, chipping, pulverization, pellet extrusion, drying, and oversea transport) as 322 kg $CO_2$ per tonne of pellets, following Jonker *et al* [15], similar to an estimate by Dwivedi *et al* [14]. Also following Jonker *et al* the model assumed that pellet drying consumes 0.51 green tonnes of residues per tonne of pellets, an estimate confirmed by checking the dryer fuel to pellet production ratio in permits for two industrial-scale plants in the US [34, 35]. The model assumed residues burned to dry pellets would decompose with a *k*-constant of 0.15 if not burned for energy. Facilities that use fossil fuels to dry pellets have much higher HPT emissions [36], but this effect was not included.

## Results and discussion

### Sources of biomass burned for heat and power in the US

The US bioenergy sector can be divided into industrial plants, which mostly burn black liquor and wood to generate onsite heat and power for paper and wood products manufacturing, and non-industrial plants, which mostly burn wood to generate power for the electrical grid (figure 1). The industrial sector mostly utilizes biomass for heat; on average, just 21% of fuel energy was used for electricity generation from 2001–2016, while the smaller non-industrial sector allocated 87% of fuel energy to electricity generation [28].

Combined, industrial and non-industrial facilities burning biomass generated less than 1% of total electricity in the US in 2016 [37]. However, average annual generation over a three-year period in the non-industrial sector increased 62% from 2001–2003 to 2014–2016, while electricity generation stayed relatively constant in the industrial sector.

**Table 2.** Five scenarios for wood pellet manufacturing and use.

| Scenario | 10 years (2020) Direct $CO_2$ (t) | 10 years (2020) Net $CO_2$ (t) | 10 years (2020) NEI | 25 years (2035) Direct $CO_2$ (t) | 25 years (2035) Net $CO_2$ (t) | 25 years (2035) NEI | 40 years (2050) Direct $CO_2$ (t) | 40 years (2050) Net $CO_2$ (t) | 40 years (2050) NEI |
|---|---|---|---|---|---|---|---|---|---|
| 1: 1 tonne pellets $yr^{-1}$, $k = 0.15$ | 25 | 14 | 55% | 62 | 21 | 34% | 99 | 26 | 26% |
| 2: 1 tonne pellets $yr^{-1}$, $k = 0.03$ | 25 | 20 | 79% | 62 | 40 | 64% | 99 | 54 | 54% |
| | Direct $CO_2$ (Gt) | Net $CO_2$ (Gt) | NEI | Direct $CO_2$ (Gt) | Net $CO_2$ (Gt) | NEI | Direct $CO_2$ (Gt) | Net $CO_2$ (Gt) | NEI |
| 3: Actual US exports to year 7 (2017); modeled 15% $yr^{-1}$ increase to 12.8 Mt $yr^{-1}$ at year 15 (2025); continue at that level; $k = 0.083$ | 0.09 | 0.07 | 73% | 0.53 | 0.28 | 53% | 1.01 | 0.40 | 39% |
| 4: Like Scenario 4, but cease use at year 20 (2030); $k = 0.083$ | 0.09 | 0.07 | 73% | 0.37 | 0.16 | 43% | 0.37 | 0.08 | 21% |
| 5: Actual global demand of 13 Mt tonne pellets $yr^{-1}$, increasing to 28.2 Mt at yr 6 (2016); modeled increase to 66.4 Mt $yr^{-1}$ at year 15 (2025); continue at that level; $k = 0.083$ | 0.63 | 0.44 | 71% | 2.92 | 1.48 | 51% | 5.35 | 1.99 | 32% |

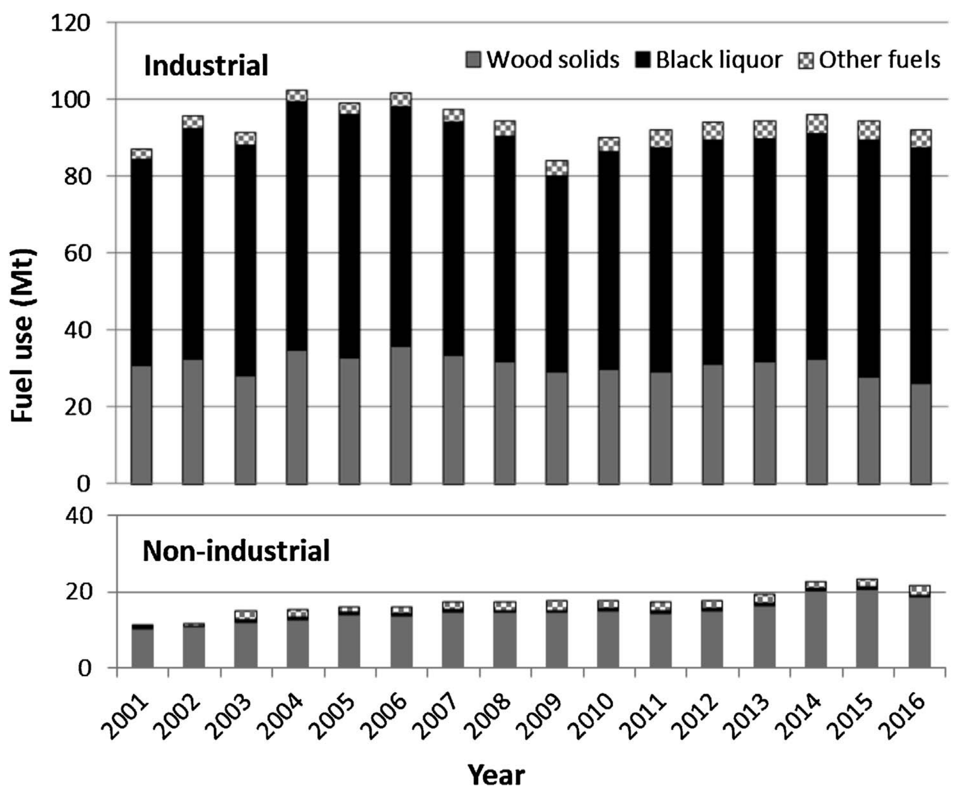


**Figure 1.** Fuels burned by the US industrial and non-industrial bioenergy sectors, 2001–2016 [28]. Wood burning for electricity generation in the non-industrial sector increased by about 60% from the beginning of the period.

The dominance of black liquor as fuel for industrial bioenergy means that many facilities at least partially meet the first of the low carbon conditions—that fuels genuinely be residues of some other process. However, the provenance is less clear for wood burned by the industrial and non-industrial sectors, which totaled 45 Mt (green) in 2016 [28]. Forisk estimates wood use by US biomass facilities at 35 Mt (green), a figure that omits certain large industrial users reported by the EIA, and reported as of late 2016 that operating and under-construction plants were burning pulpwood (7.4%); 'dirty chips/forest residues' (49.6%); urban wood (19.4%); and mill residues (23%) [33].

Residues appear to provide the most fuel for US bioenergy sector, but since there is no set definition for 'residues,' it is not possible to know if this wood is truly the product of some other process. Conservative definitions for forest residues are found in Domke *et al*: the 'tip, portion of the stem above the merchantable bole, and all branches, and excluding foliage'

**Figure 2.** Trucks lined up waiting to deliver pellet feedstock to North Carolina plant owned by Enviva, the largest US pellet manufacturer. Much of the wood is tree trunks, not tops and limbs (Photo: Dogwood Alliance).

[20], and Laganière *et al*: 'all woody debris generated in harvest operations for traditional wood products (e.g. branches, tree tops, bark), excluding stumps and downed nonmerchantable trees' [12]. However, practices on the ground vary. For example, Dominion Energy Resources in Virginia, which re-fired three coal plants with wood and has a total bioenergy capacity of over 250 MW, wrote to the EPA that waste wood 'to us' means 'forest materials including residues (tree tops, non-merchantable sections of stem, branches, and bark), small trees and other low value materials' [38]. Some facilities clearly burn whole trees for fuel, like a new 70 MW plant in Berlin, New Hampshire that burns 113 tonnes of 'clean wood chips' per hour, including 'whole tree chips' [39] (Forisk lists this plant as burning 408 000 green tonnes of hardwood pulpwood and 408 000 green tonnes of residues per year [33]). The evidence for use of whole trees as fuel suggests that many facilities do not burn materials that meet conservative definitions of residues (i.e. branches, tree-tops, and bark left over from other harvesting).

## Sources of wood utilized by the US pellet manufacturing industry

As of late 2016, annual production capacity at operating and under-construction wood pellet manufacturing facilities in the US was 13.2 Mt, requiring about 28.6 Mt of green wood as feedstock [33], though not all plants produced at capacity. Pellet companies emphasize use of residues, downplaying the use of roundwood as feedstock [40]. However, exported wood pellets must meet specifications including restrictions on bark content [41], thus there is a limit on the amount of low-diameter branches and tops that can be used. Accordingly, industry data indicate about 56% of pellet feedstock is supplied from pulpwood (41% from softwood, 14% from hardwood); 42% from mill residues, 1% from urban wood; and just 1% from logging residues [33]. Investigations of pellet feedstock at some large US mills have confirmed that a significant portion of feedstock is bolewood (figure 2). The feedstock supply from small pellet producers in the Northeastern US also appears to avoid residues; a study of nine pellet mills in Maine found only 2% came from tops and limbs, with the remainder classified as pulpwood or small diameter trees [42].

Similarly, company-supplied data on sources of wood pellets burned in the UK indicate that the majority of US pellets burned by the coal- and wood-fired Drax power station in 2015 was sourced from logs that 'formed part of the trunk of a tree which grew for at least ten years' from harvesting that was a 'mix of clearfell and thinning' [43]. While mill residues currently constitute a proportion of pellet feedstock in the US, they will not supply a meaningful amount for future capacity, because supplies are limited [44]. The dominance of pulpwood and the documented use of bolewood thus indicate that pellets often fail to meet the first condition for low carbon residues, that feedstocks genuinely be residues that if not collected would otherwise decompose or be burned without energy recovery.

## Emissions from the US biomass industry

Emissions modeling examined the industrial and non-industrial bioenergy sectors separately. The model estimated cumulative direct $CO_2$ emissions from industrial facilities at 1135 Mt at year 10. However, because black liquor and other wastes provide a large proportion of industrial sector biomass, and the assumed alternate fate for these materials is combustion without energy recovery, cumulative net emissions are 224 Mt, for an NEI of 20% (figure 3(*a*)). Cumulative direct emissions for the smaller non-industrial sector are 208 Mt at year 10, but because the majority of fuel for this sector is wood and the weighted *k*-constant is lower, cumulative net emissions are 120 Mt and the NEI is 58% at year 10 (figure 3(*b*)). Both sectors show cumulative net emissions still increasing in the 40–50 year period, though less steeply than in the initial decades.

This analysis calculates emissions at the sector level as if all units initiated operation at the same time, while ideally, sector-level accounting would consider how long each facility has been operating. While inadequate data render this impractical, in general, the industrial sector has shrunk since the 1980s [45] and the present day NEI should be shifted toward the right (lower), as facilities are on average older. In contrast,

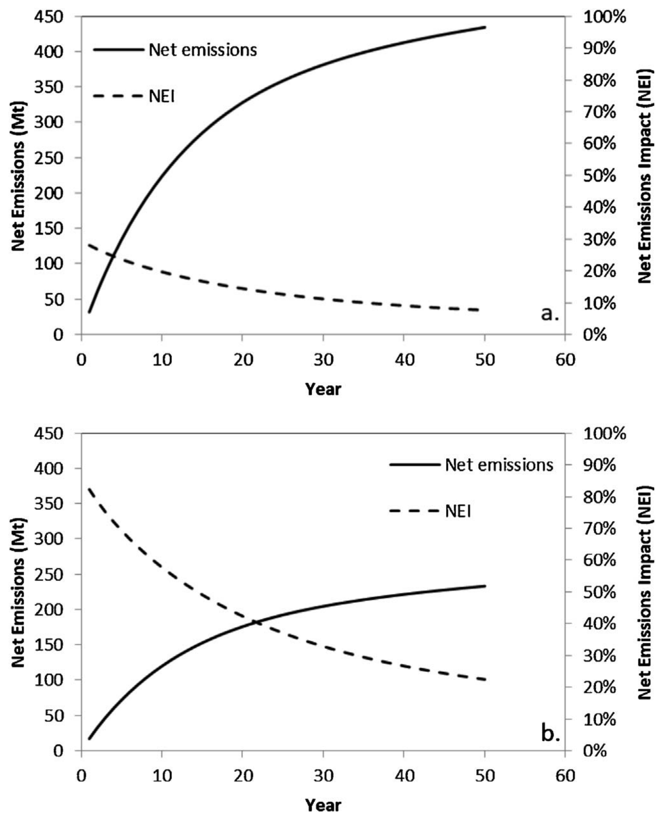


**Figure 3.** Cumulative net emissions and the NEI for the industrial (*a*) and non-industrial (*b*) bioenergy sectors over a 50 year timeframe, estimated using the average fuel mix for 2001–2016. High use of black liquor as fuel reduces the NEI for the industrial sector, while greater reliance on wood increases it for the non-industrial sector.

new construction of wood burning power plants and coal-to-wood conversions in the non-industrial sector since the early 2000s (figure 1) [28] means the average age of the sector is younger, shifting the NEI to the left (higher).

### Refined emissions estimates for new wood-burning power plants

The industry-level analysis assumed an average *k*-constant for wood of 0.083, but plotting the NEI against the full range of *k*-constants (figure 4) demonstrates that the NEI for facilities burning forest residues exceeds 70% at year 10 for all decomposition constants lower than 0.07, and exceeds 40% at year 10 for the full range of decomposition constants for North American forests [46]. This conclusion is likely valid even if the alternative fate for wood is not being left in the forest to decompose, but disposal in a landfill. Conversion of carbon in landfilled wood to landfill gas (carbon dioxide and methane) is generally less than 3% after landfilling [47], thus even taking methane's global warming potential into account, the NEI from burning wood that would otherwise be landfilled is greater than 40% at year 10.

On a practical level, estimating stack emissions from a biomass power plant is easy, but estimating net emissions can be difficult, because the *k*-constant for wood can vary [48, 49]. One solution is to 'bracket' likely net emissions using a range of decomposition constants to estimate the NEI. Since burning a tonne of green wood emits about one tonne of $CO_2$, yearly direct emissions assuming a 4% HPT adjustment are about 1.04 tonnes per tonne of fuel, and cumulative direct emissions at year 10 are 10.4 tonnes. Taking a biomass facility located in the US southeast as an example, average decomposition constants for southeastern hardwoods (0.082) and softwoods (0.057) [46] translate to values of 67% and 75% on the ten year NEI curve; multiplying these NEI values by direct emissions gives cumulative net emissions of 6.97–7.80 tonnes of $CO_2$ at year 10 for each tonne of wood burned at such a facility. This approach to bracketing emissions could have policy applications. For instance, using the NEI to estimate net biogenic emissions could help integrate biomass power plants into carbon trading and carbon tax programs, as well as qualify bioenergy for renewable energy subsidies.

### Emissions from wood pellets manufactured from residues

Emissions estimates for pellets calculated by the model certainly underestimate actual $CO_2$ impacts because tree boles constitute a large proportion of pellet feedstock, and it is unlikely that the true alternative fate for these materials is to be left onsite to decompose. However, calculating emissions as if claims about use of residues [40] were fully accurate can establish one type of 'best case' scenario for pellet emissions. Modeled

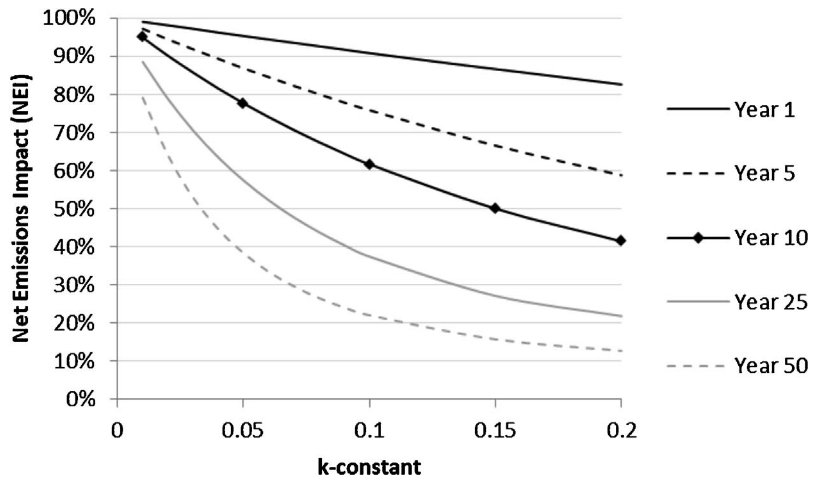


**Figure 4.** The NEI as a function of the *k*-constant at different points in time, assuming a 4% HPT adjustment. The NEI at year 10 is always greater than 40%, even when decomposition is assumed to be rapid.

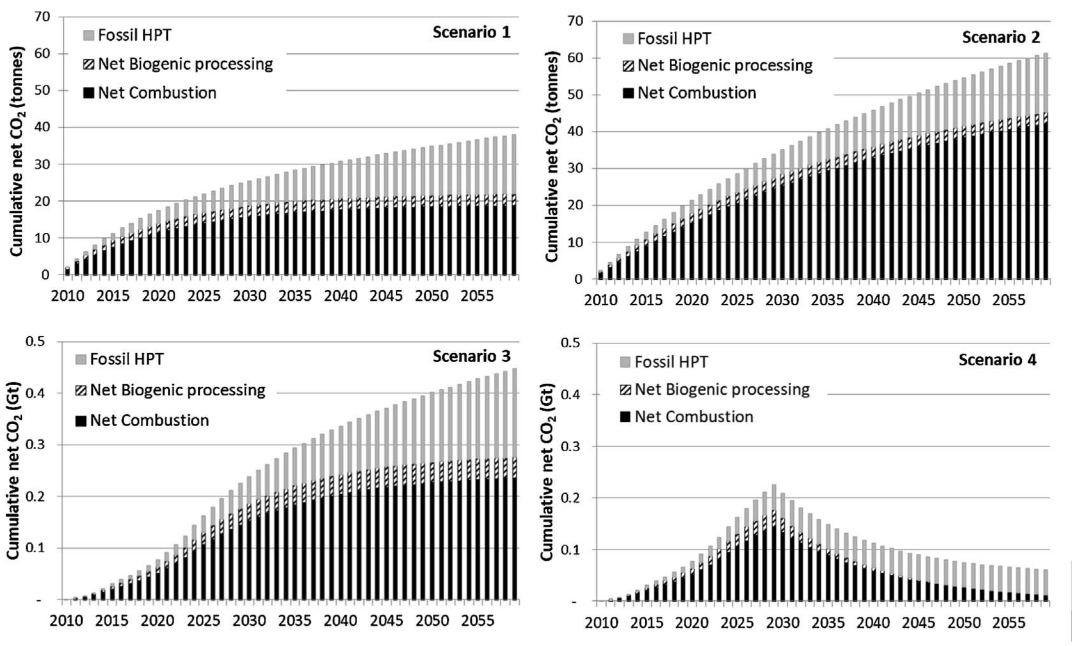


**Figure 5.** Cumulative net emissions for wood pellet scenarios 1–4 (details provided in table 2).

scenarios 1 and 2 estimate emissions from producing and burning one tonne of pellets per year from roundwood that is assumed to otherwise decompose onsite (figure 5 and table 2), illustrating the importance of the *k*-constant for net emissions. Even assuming very rapid decomposition ($k = 0.15$) as the counterfactual, the NEI for Scenario 1 is 55% at year 10. Scenario 2 employs a low *k*-constant (0.03) representing slower decomposition in a cool climate [11] such as Canada, and has an NEI of 79% at year 10; by year 25, cumulative net emissions are 40 tonnes $CO_2$ per tonne of pellet capacity, nearly double those of Scenario 1. Thus for both scenarios, simply counting cumulative direct emissions at year 10 would provide a closer representation of the emissions impact than characterizing pellets as 'carbon neutral,' as is current practice.

Scenarios 3 and 4 estimate net emissions from actual US pellet exports 2010–2016 [4, 5, 50, 51] followed by an increase to 12.8 Mt in 2024, commensurate with US exports meeting half of predicted short-term global demand for utility and industrial-use wood pellets by 2025 [5, 7]. These scenarios use a *k*-constant of 0.083, following a UK government-commissioned study on lifecycle impacts of wood pellets [11] that used values from a study of forest wood decay in North Carolina [52]. Accelerating use in the first part of scenario 3 elevates the NEI because decomposition emissions do not come into equilibrium with combustion emissions while pellet use keeps increasing. The NEI is 73% at year 10, 39% at year 40 and 34% at year 50. Scenario 4, where pellet use is terminated at year 20 (2030), has an NEI of 43% at year

25, because cumulative decomposition emissions of the counterfactual still have not caught up to combustion emissions from the early years of the scenario. This scenario shows a carbon benefit in terms of reduced emissions over time, but it requires actually stopping use of the fuel for this to occur.

Scenario 5 (shown in table 2 but not figure 5) uses actual data on global pellet use for 2010–2016, then projects growth to 66.4 Mt in 2025 [53], after which the model assumes demand is flat. It assumes not all pellets are manufactured in North America, thus HPT emissions are reduced by 15% to reflect shorter transport distances. With a pellet energy content of 17.5 MJ $kg^{-1}$ [54], peak use of 66.4 Mt $yr^{-1}$ represents 1.16 EJ annually, or just over 1% of the 100 EJ of new bioenergy projected to play a role in some mitigation models [1–3]. By year 40 (2050), cumulative net emissions are 1.99 Gt and are growing at 30 Mt per year.

The pellet scenarios demonstrate that fossil HPT emissions increase continuously with pellet use and represent a substantial 'non-vanishing' [25] fraction of net emissions. In reality, the model probably undercounts HPT emissions because it does not include releases of nitrous oxide emissions from fertilizer used on tree plantations [55] or methane emissions from wood chip piles [56] and finished pellets [36, 57]. Buildup of methane and other hazardous gases during transport and storage [58] is of concern to the wood pellet industry [59], and has the potential to add significantly to lifecycle greenhouse gas emissions [36]. The model also omits combustion emissions of black carbon, a significant climate forcer [60].

Most importantly, calculating net emissions from wood pellets as if feedstocks are derived from forest residues underestimates emissions because a large proportion of pellets are made from trees, not residues [41 61]. For instance, Stephenson and McCay (2014) [11] found net emissions were 10–12 times higher at year 40 when native hardwood trees are harvested for fuel, a practice that has been well documented in the US south [33, 41, 62, 63].

## Conclusions

For bioenergy to offer genuine climate mitigation, it is essential to move beyond the assumption of instantaneous carbon neutrality. The NEI approach provides a simple means to estimate net bioenergy emissions over time, albeit one that tends to underestimate actual impacts. The model finds that for plants burning locally sourced wood residues, from 41% (extremely rapid decomposition) to 95% (very slow decomposition) of cumulative direct emissions should be counted as contributing to atmospheric carbon loading by year 10. Even by year 50 and beyond, the model shows that net emissions are a significant proportion of direct emissions for many fuels. Similarly, the model concludes that for wood pellets manufactured from residues in in the US and shipped overseas, even a rapid decomposition counterfactual produces an NEI of 55% at year 10, while a slow decomposition counterfactual produces an NEI of 79%. By year 40, net emissions still represent 25% to more than 50% of direct emissions. Scenarios that increase the amount of biomass burned each year, as is currently occurring in the EU, have even larger net emissions impacts.

Models like this have their critics. The IPCC warns that using a 'simple sum of the net $CO_2$ fluxes over time' to highlight the 'skewed time distribution between sources and sinks,' is probably insufficient to understand the climate implications of bioenergy, which instead requires models that include temperature effects and climate consequences [3]. Bioenergy advocates have seized on models that emphasize the importance of cumulative emissions for warming, pointing out that bioenergy can reduce carbon impacts over time compared to fossil fuels [23], though they say little about carbon impacts when bioenergy displaces zero-emissions technologies.

However, since the IPCC's call for more complex bioenergy modeling was published in 2014, the intensity of the climate crisis has deepened; in the US, legislation has been enacted that compels the EPA to treat bioenergy as carbon neutral [64]; and combustion of forest wood by the EU, UK and Asia is increasing each year, unmitigated by the carbon capture and storage that some climate models say is required [65]. Also while the climate modeling community ponders, governments are making practical decisions about renewable energy funding, as in the UK, where the government provided £809 m (about $1.2 b) [66 67] in subsidies to biomass electricity in 2015, the same year it announced it was terminating subsidies for offshore wind earlier than planned [68]. Since residues would eventually release carbon to the atmosphere whether through burning or decomposition, any putative reduction in $CO_2$ emissions actually depends on residues-fueled bioenergy displacing fossil fuels, but in the UK, it appears bioenergy may instead be displacing zero emissions technologies, while prolonging the life of coal plants that partially switch to subsidized wood burning.

There is no time like the present to reduce emissions. Given the anticipated role for bioenergy in climate mitigation, climate-related policies should be reformed immediately to account for bioenergy impacts. Using the NEI to weight biogenic $CO_2$ for inclusion in US and EU carbon trading programs and to qualify bioenergy for renewable energy subsidies would reduce emissions more effectively than continuing with the current assumption of zero emissions, though for wood pellets sourced from bolewood, counting direct emissions is a more protective and accurate approach.

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Pellet Fuels Institute®

December 21, 2023

Department of Environmental Protection
100 Cambridge Street
Boston, MA 02114

Re: Urging the Inclusion of Modern Wood Heat in the Massachusetts Clean Heat Standard

To Whom it May Concern;

The Pellet Fuels Institute (PFI), a trade organization representing the manufacturers of wood pellets for home heating and cooking applications, urges the Massachusetts Department of Environmental Protection to reverse its initial exclusion of modern wood and wood pellet heating from its Clean Heat Standard.

The PFI has already signed on to the Good Wood Coalition of December 21, 2023 letter that succinctly articulates how and why modern wood heat can and should be included in a portfolio of technologies to reduce the carbon intensity of heating in the Commonwealth. This letter is meant to underscore the incredible story of waste utilization in the forest products sector that is supported by the domestic market for wood pellets as a heating and cooking fuel.

Wood pellets for home heating and barbecuing applications are manufactured almost exclusively from the by-products of sawmills and wood product manufacturing sites, allowing the forest products sector to make good use of the entirety of every harvested tree. The U.S. Energy Information Administration (EIA) collects and publishes the wood residue purchases from these sites in its Monthly Densified Biomass Fuel Report. The report shows that through September, sawmill residual purchases by wood pellet manufacturers in 2023 surpass **5.8 million tons**. Wood pellet manufacturers paid over $213 million for these materials. Residual purchases from secondary wood product manufacturing sites total **336,000 tons** over the same timeframe at a total cost of over $13 million. These residual purchases bolster the balance sheets of forest products manufacturing sites around the country, including those within the Commonwealth.

Please reconsider your exclusion of modern wood heating from your forthcoming Clean Heat Standard. Curtailing wood pellet usage will only serve as an impediment to a carbon-beneficial, wood-waste remediation technology delivering clean, renewable heat to citizens of the Commonwealth today while returning real economic value to the forest products sector within Massachusetts.

Sincerely,

Tim Portz
Executive Director
Pellet Fuels Institute

SailEnergy

January 16, 2024

Department of Environmental Protection
100 Cambridge Steet
Boston, MA 02114

Re: Massachusetts Clean Heat Standard - Draft Framework Comments

Sent via email: climate.strategies@mass.gov

Thank you for the opportunity to comment on the CHS draft framework. **Our company, Pioneer Oil & Propane, is a small business located in Sturbridge, Massachusetts. We employ over 25 Massachusetts citizens and support our local communities through a variety of charitable efforts. Our business provides fuel and hvac repair for thousands of homes in the greater Sturbridge/ Worcester area.**

We are concerned that MA DEP is making a mistake by not incentivizing the usage of propane in the Commonwealth. Prioritizing electric heat pumps, over cleaner propane systems will increase emissions in our state. We urge DEP to consider providing credits for geologic propane and treating it in the same manner as MA classifies renewable biomass. Propane is a beneficial by-product of natural gas processing and if it is not used it is wasted. As a waste product, it should be incentivized not only so that it will lower GHG emissions in MA, but also so that it will be available as a reliable affordable energy source for energy security during times or emergencies.

Today, geologic propane in MA has a carbon intensity of 77 which is less than the carbon intensity of electricity and heat pumps in MA which is 100 – 140 depending on how cold the winter is each year. Even if MA electricity becomes cleaner, it still makes no sense to disincentivize propane systems as the propane industry will continue to lower its carbon intensity with the addition of renewable propane blends. Our industry has a clean product, but we are not satisfied, and our goal in MA is to always have a lower carbon intensity than MA electricity and heat pumps. Thus, if MA DEP is indeed trying to reduce carbon emissions today with a CHS, propane should simply be awarded clean heat credits.

The underlying premise of the CHS is to reduce greenhouse gas (GHG) emissions. As such, the program should focus less on the type of energy delivered – molecules or electrons – and more on the ability of any technology to immediately reduce GHG emissions from thermal applications. The current standards focus too much on electrification rather than decarbonization. A better framework would incentivize lower carbon intensive propane systems then the framework structure would focus on actual carbon reductions.

Finally, renewable propane should be incentivized in MA by DEP taking the lead to promote renewable propane development in the state. DEP could be leading the way and setting an example of how to reduce emissions while maintaining an equitable solution to energy security. MA must have backup energy for electricity outages and extreme weather events. Propane fills this role today as the backup fuel for generators across our state, and its use should be increased in the state to make sure we have environmental equity and affordability. MA must be conscious of the huge environmental impact of batteries and heavy metals. MA must not incentivize battery storage because doing so would be detrimental to the most vulnerable environmental justice populations on earth. We must not create more child labor and strip mining in the Republic of Congo and other developing countries. We have a clean solution in propane at our fingertips supported by local businesses like my own already in place that we should be incentivizing to make sure that we have a clean solution to energy security needs in our state.
Respectfully submitted,

**Joseph Trefethen**
**New England Region Manager**
**Pioneer Oil & Propane**
**59 Technology Park Rd, Sturbridge, MA 01566**

12-20-2023

To whom it may concern at the MA DEP;

As it relates to your relatively short and poorly advertised comment period on the Clean heat standard (CHS), my name is Doug Plissey and I am a resident – homeowner in East Freetown. We heat with propane gas and supplement with an electric mini- split ductless system and finally a woodstove on the really cold days or when the power goes out.

I am the 3rd generation owner of a small family owned propane company located in Southeastern MA that was founded in 1959 by my Grandparents and rebranded in 1976 by my parents into our present company. Our two adult sons also work alongside us in our business and we had hoped to continue our heritage into the 4th generation. We employ and work alongside 20 local folks who are like family to us.

As a small "mom and pop" type business we have always provided a clean, reliable, safe & versatile fuel to our friends and neighbors. Propane has always been a "can do", resilient fuel for almost all applications of daily life. From heating homes, providing hot water, cooking, refrigeration, back up gas lighting, fuel for our cranberry farmers in the production of cranberry's, fueling automotive vehicles as a recognized "clean fuel" by the Federal EPA as well as the best backup and portable fuel source for emergency power generators on MANY homes and businesses (including some local municipalities – fire departments, Town Halls, senior centers etc), the list goes on. Propane is not just a tank of gas found on your gas grill.

While we all want clean air coupled with the balance of reliable and safe comfort and energy sources for our families, I find that the narrow minded pathway as presented by the DEP and the Commonwealth of MA does not take into consideration a fuel that has been around almost longer than electricity. While propane makes up less than an 8 percent segment of the fuel industry in MA it has always been there in the time of need and is recognized federally as a "clean fuel" in its standard / conventional state. So, why does it get "lumped in" as a bad and dirty fossil fuel, with no consideration in your pathway to a clean future? Propane also does NOT contain methane (such as found in natural gas) which is also a concern over methane release and the environment.

From all studies, the current carbon intensity of standard propane (79 g/Mj) is LESS than that of what is being produced for the Commonwealth of MA (at 100 g/Mj) by burning natural gas. Right now – today…My customers can achieve 96 percent efficiency directly at their homes with their propane burning heating systems and 99.9 percent efficiency with vent free propane space heaters. Why do your studies (DEP) and data NOT go back to the full source / cycle from electrical generation to the end consumer? This is similar to comparing apples to pineapples and is not the same comparison.

Now with the advent of "renewable propane" (that is not considered a fossil fuel) why will DEP not consider any exemption? Renewable propane and renewable blends can achieve much less of a carbon intensity (which I think is the goal?). If you do not know about it, it is your responsibility in educating yourselves and everyone involved for full knowledge before final decision making.

To help meet environmental commitments personally, our propane company started selling and installing ductless mini-split systems over the past few years and are also a registered MA Save partner. However I would have to say that we are disappointed with the MA Save program as they are not organized with providing timely payments for completed rebates and some “hoops to jump through” with the program. As a small business I cannot wait months to get reimbursed $10,000 payments for <u>each</u> project. I am finding what was a good program to start is showing signs of failing. This will only get worse if not corrected especially as rebate recipients grow with your pathway to electrification as many, including myself may pull out of the program.

I had only found out in the past few weeks about the DEP and the soon to be implemented CHS going into effect, as well as the comment period that I believe was pushed through with little notice to the common working folks and general populace.

It would do well from a transparency stand point for the DEP and the Commonwealth of MA to do an even better effort to the 2.9 million residences in MA that will be affected by these initiatives. This could be done by media, radio, newspaper, online or even by postal mail – postcard (especially to alert the older folks such as my parents who are not online but should have a say as a long time resident and homeowner that will be affected). A good faith effort and to validate the commitment on the part of DEP would be to extend the comment period by 6 months to also include an educational campaign and better comment period. Then let the people speak.

As I understand the program you will ultimately be “taxing” and punishing the general populace (call it what you will) with the obligatory compliance payments you will require that will be forced on the end user.

As a multi generational small business you will ultimately put us out of business as well as force our employees out of a job. You will also put our customers, neighbors and friends in a position of not having any security in their energy use or choice and will increase the cost overall with decisions having to be made between putting food on the table or have a economical, reliable heat source they can afford. I can’t even image how this will affect the elderly population already struggling.

My recommendation and final comments is to encourage DEP to commit to review and educate yourselves on propane / renewable propane, and the current state of affairs with the failing MA Save program as well as educating the public more and allow for a longer comment period.

Thank you for your time.

Best regards

doug

PowerOptions
Powering Nonprofits

***Via Electronic Mail***

December 19, 2023

Commissioner Bonnie Heiple
Massachusetts Department of Environmental Protection (DEP)
1 Winter Street
Boston, MA 02108

Re: PowerOptions comments: Massachusetts Clean Heat Standard

Dear Commissioner Heiple,

PowerOptions appreciates the opportunity to provide further comments to continue to inform the development of a proposed Clean Heat Standard ("CHS") regulation. As background, PowerOptions represents more than 400 members in Massachusetts, all nonprofit and public entities, including community and human service agencies, housing authorities, municipalities, hospitals, healthcare systems, colleges, and universities. Across the state, our Members represent more than 7 million dekatherms of natural gas load and more than 1 million MegaWatt-hours of electric load. Our mission is to reduce the cost, carbon emissions, and complexity of energy for our Members. As such, we applaud the Massachusetts Commission on Clean Heat's efforts to create a CHS to support the Commonwealth's Clean Energy and Climate Plan for 2025 and 2030. However, it is important to ensure any new standard is developed with adequate equity protections while minimizing cost impacts to consumers. We continue to offer our comments with this in mind.

We appreciate the DEP's efforts to ensure equitable outcomes with the implementation of a CHS. The Equity Carve-out, the Just Transition Fee, and the increased ACP revenue for low-income conversions, including all of these ACP funds being directed to future low-income electrification projects, will enhance the affordability of electrification conversions for low-income households. However, we think it is important for the Commonwealth as a whole to consider that the electrification of households will result in increased operating costs for energy usage. Although electrification may be a choice, to truly incentivize customers, consideration must be given to reducing the increased operating costs that result from electrification—in particular for low-income households. One option to reduce the energy burden of low-income customers is to implement an all-electric or heat pump electricity rate. We recognize new rates are not the purview of the DEP, but we raise for discussion and consideration in collaboration with your partners in state government.

With respect to the implementation of the compliance standard itself, we urge the DEP to set the standard in a manner that ensures predictability and insight into future costs for Suppliers and therefore in the costs being passed through to customers. One of the main reasons consumers participate in the competitive supply markets is to ensure budget certainty, and often execute competitive supply contracts for multiple years to ensure that budget stability into the future. Budget certainty and stability is of the utmost importance for our nonprofit Members, who have limited budgets and resources. The continuous Changes In Law to the various standards to promote clean energy in Massachusetts over the years without adequate exemptions for existing executed supply contracts has made budget certainty for our Members nearly impossible. Also, Changes in Law also create an opportunity for Suppliers with nontransparent practices to include other additional costs beyond the regulatory change during the term of a contract. We understand a Supplier compliance standard structure is an established structure for clean energy programs in Massachusetts, but again costs and budget certainty to customers must be carefully considered.

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 continues to move forward with the development of the CHS.

Sincerely,

Heather Takle
President & CEO

***VIA EMAIL TO* *climate.strategies@mass.gov***

December 21, 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 programs,[1] we thank you for the opportunity to respond to the Massachusetts Department of Environmental Protection's ("DEP") "Draft Program Framework" for a potential Clean Heat Standard ("CHS"). Each of the individual PAs may also file company-specific comments.

In our prior comments dated May 3, 2023, we noted that a well-designed CHS would integrate smoothly with Mass Save programs, which already provide significant support to customers who choose to adopt clean heat solutions like air- and ground-source heat pumps. In fact, the PAs remain on track to exceed their targets for heat pump deployments in the market-rate residential sector during the current 2022–2024 term.[2] A well-designed CHS will build on this success and avoid layering in contradictory or conflicting requirements for heat pump installations. To drive additional building-sector GHG emissions reductions, the CHS should fill regulatory gaps for segments of the heating sector that Mass Save programs cannot reach now. *In its current form, however, the CHS will not achieve these objectives and risks undermining substantial progress in building a Massachusetts heat pump market.*

Under the current regulatory framework, the Mass Save programs cannot provide rebates for installing heat pumps and insulating homes and businesses to customers who are not served by a PA. These customers are served by municipal utilities, which may or may not offer clean heat incentives, and in some cases by delivered fuels, primarily heating oil and propane. Also, these customers do not contribute to funding heat pump deployments because municipal utilities and

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[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.

[2] Through the third quarter of 2023, the PAs have incentivized the installation of heat pumps at 37,688 homes against a 2022-2024 term-wide target of 63,409 (both figures combined across the market-rate residential and income-eligible programs).

delivered fuels providers do not collect the energy efficiency surcharge that the PAs use to fund heat pump and weatherization incentives. By requiring municipal utilities and delivered fuels suppliers to pay a clean heat fee and using those funds to support customers who switch to electric heat pumps, the Clean Heat Standard will fill a significant gap in existing policy.

By contrast, the Draft Regulatory Framework's proposal to impose a compliance obligation on all forms of heating fuels, including electricity, would serve to increase the cost of electricity and deter customers from adopting heat pumps. Instead, to create meaningful incentives for customers, the CHS needs to raise the cost of GHG-intensive fuels, such as oil and propane, relative to electricity.

A policy as simple as assessing a surcharge on fossil fuels with revenues directed towards electrification, with all or most revenues dedicated to low- and moderate-income ("LMI") customers, would fill these regulatory gaps and satisfy DEP's broad and flexible direction from the Clean Heat Commission. A cap-and-trade crediting system along the lines of the Draft Regulatory Framework *may* provide greater certainty that non-clean heat will phase out by a specified date, but it will be certain to impose costly administrative burdens. If a crediting system is adopted, it should ramp down as GHG-intensive fuels are phased out. It does *not* need to persist indefinitely by including credit-generation requirements on electric ratepayers—again, this will deter customers from transitioning to clean heat by raising the cost of electricity.[3]

Further, the PAs are concerned that the Draft Regulatory Framework's proposal to require compliance by demonstrating both clean heat installations (through "full electrification credits") and ongoing operation (through "emission reduction credits") is unnecessarily complex. For customers who already have access to Mass Save rebates, the full electrification credit proposal would create customer confusion and complicate the decisions for customers, installers, and fuel providers. For example, although we appreciate the intent of assigning Clean Heat Credits to customers in the first instance, realistically, this will lead to disputes among installers, obligated entities, and the PAs over who will contract with customers to acquire Clean Heat Credits. More broadly, the PAs are concerned that too little attention has been paid to the challenges customers will face in trying to engage in a credit marketplace. Home electrification projects are complex enough, and the Draft Regulatory Framework only risks adding complications. We note that the closest analogue for the proposed home heating credit marketplace—the rooftop solar market—saw the state abandon the SREC I and SREC II credit market in favor of a uniform, declining tariff embodied in the SMART program. As with solar, homeowners and installers need incentives that are clear to navigate, unlike the proposed CHS.

[3] Synapse Energy Economics gets this right in its memorandum to DEP. *Options for Role of Electric Distribution Companies (EDCs), Obligated Fuels, and Obligated Entities* (May 8, 2023) at 5 ("[A]n ideal policy would lower (or not increase) electricity prices and raise (or not lower) fossil prices. Higher electricity prices degrade the economics of switching to heat pumps, requiring higher incentives to persuade customers to switch. Conversely, higher fossil prices improve the economics of electrification, reducing the incentive required to encourage customers to switch.").

In closing, the PAs appreciate the deliberate and transparent method by which DEP has conducted this regulatory process to date. We are not aware of a Clean Heat Standard that has been implemented at this scale elsewhere, so a methodical and collaborative process to develop this policy is essential. Although we recommend significant changes from the Draft Regulatory Framework, DEP's careful process to date will allow for the current proposal to continue to evolve to better support the Commonwealth's policy needs as it pursues the objectives of the 2050 Clean Energy and Climate Plan.

We look forward to engaging with DEP as this process continues. Please do not hesitate to be in touch if we can answer any questions about our comments or the Draft Regulatory Framework.

Sincerely,

The Massachusetts Program Administrators

Katherine Peters
Director, Residential Energy Efficiency
Eversource Energy

Christopher Porter
Director, Customer Energy Management
National Grid

Cindy L. Carroll
Vice President, Customer Energy Solutions
Unitil Service Corp.

Hammad Chaudhry
Hammad Chaudhry
Senior Manager, Conservation and Load Management
The Berkshire Gas Company

/s/ Kimberly Dragoo
Kimberly Dragoo
Director, Key Accounts and Programs
Liberty Utilities

Margaret T. Downey
Administrator
Cape Light Compact JPE

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Bureau of Air & Waste

# PROPANE PLUS HEATING & COOLING

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Phone 508-252-3359 ~ Fax 508-252-9944

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

RE: Clean Heat Standard Stakeholder Commentary #2

To Whom It May Concern,

Today I write to you as a frustrated stakeholder regarding the proposed Massachusetts Clean Heat Standard. I am the Owner of Propane Plus, Corp. headquartered in Rehoboth, serving 40+ communities and 5000+ customers. We have been in business 30+ years.

My company sells deliverable fuels (heating oil, propane, biofuel, diesel, gasoline, 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.

I regretfully write this letter that after months of stakeholder input MA DEP has not addressed many of the basic questions provided in stakeholder comment or provided additional clarity on the workings of the MA CHS. Despite 300 plus pages of letters, many, many hours of testimony from stakeholders, and solutions being proposed, the MA DEP has yet to revise or even address any one of a number of holes in their proposed regulations.

For a regulation that will cost Massachusetts consumers in the estimated ***tens of billions of dollars*** the lack of study on the potential economic impact on MA consumers of these regulations is irresponsible. The lack of quantification of the actual climate impact these measures seek to mitigate is careless at best and at worst an ***intended omission.*** The fact is these regulations are still -un-qualified in terms of cost and questionable climate impact at this late stage of the proposal is unconscionable. The nonchalant way MA DEP is dealing with these foundational questions and others is frustrating to those who have dutifully participated in the stakeholder process, have asked for working formulas, processes or guidance on these issues over many months.

What MA DEP ***has clarified*** is the MA CHS proposing is an ***Electrify Everything Expensively with Heat Pumps*** regulation. The regulation is certainly not technology neutral as proposed by the CEPC. How does MA DEP propose this regulation with not only zero consideration of MA consumers but no discussion of increased demand for electricity, potential electrical generation shortfalls, electric grid capacity issues or a grid reliability study that details the increased cost for ratepayers to fund all this electrification. In addition, they also have not addressed the cost and availability of mechanical heat pumps, the skilled labor to install them, consumer's ability to pay for these mechanical upgrades nor a timetable for implementation for the MA CHS.

There has been a lot of talk in the CHS meetings about equity and justice for low income and BIPOC communities. As of the writing of this letter there has been zero cost estimate of these proposed regulations for these (or any) communities. That omission is a clear (and purposeful?) oversight when proposing this regulation as the cost to Massachusetts consumers is estimated to approach the $10's of billions over the course of a decade or so.

Deliverable fuel dealers in the state have been providing sustainable and affordable heating fuel to Massachusetts consumers for many decades. These small businesses have reacted to consumer demand about reducing carbon intensity and other greenhouse gases in the fuels that Massachusetts homes burn. They have implemented cleaner alternative fuels such as bioheat, biodiesel, renewable propane, renewable heating oil, low sulfur diesel. Most of these fuel-based carbon-reduction strategies are not all considered in the "CLEAN" Heat Standard. How does this happen?

The track record of deliverable fuel dealers in the state being environmentally friendly and reducing carbon impact over the many decades of being in business is something that we are all proud of. Massachusetts customers reward our small business with their loyalty and trust. For every boiler replacement, furnace upgrade, or thermostat replacement we have quantifiably demonstrated our commitment to reducing our customers' environmental and climate impact. We have made many of these mechanical efficiency improvements in Massachusetts homeowners' basements for decades. Keep in mind most of these initiatives were initiated by dealers themselves in order to serve their customers (the consumers of Massachusetts) with a more efficient sustainable, and affordable way to heat their homes. In our role as trusted home heating companies, we will continue to communicate to our customers that the MA CHS as written is a bad deal for them.

I get the feeling that MA DEP has been guided alone the most difficult path on purpose and has been advised to go out of its way to propose the most progressive regulations not only in the northeast but in the United States in order to meet the ticking due date of the MA Climate goals. MA CHS has a % carbon reduction goal per year over and above anything else proposed in the United States! Clearly, MA DEP (and its green policy wonks who attempt to advise regulators in multiple states) see MA consumers as their own guinea pig/test tube experiment for pushing climate-action agenda. It looks as if Massachusetts consumers will become the victim of MA DEP's inaction since 2008 and their attempt to solve for X by placing the burden of carbon reduction on the deliverable fuels industry and all MA consumers. I question whether parts of the MA CHS program that MA DEP has authored are even legal in regard to maintaining small business-competitiveness in the state.

It is not too late to change course! Listen to stakeholders and revise this revision of the MA CHS to something that looks like an actionable regulation and is in line with other states' laws on the books. There are many models out there and, any great proposals from stakeholders that MA DEP has (so far) failed to consider. Failure to do so will further delay implementation of MA CHS and will certainly not bring the state any closer to achieving its' climate goals.

In summary, the CHS regulations, as written, will 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. 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 study of 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,

Tim Johnson
Owner
Propane Plus Corp.

## Parnay, Angela L (DEP)

**From:** Tim Johnson <tim@propaneplus.com>
**Sent:** Tuesday, December 12, 2023 8:39 AM
**To:** Strategies, Climate (DEP)
**Subject:** comments
**Attachments:** DEP Comments.doc

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

I hope you will consider some live testimony on why propane is better than natural gas, oil, and wood heat.

Tim

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December 12, 2023

Dear DEP:

After listening to the public comment portion of your call last night I felt the need to write down my comments. The forum was terrible for a discussion. Propane is being treated extremely unfairly in this process and we don't even have a seat at the table.

My name is Tim Johnson. I own Propane Plus in Rehoboth, Ma. We are a 2nd generation propane company covering all of SE Mass and RI. We install propane heating systems as well as heat pumps as well as delivering propane to MA residences. We employ 20 hardworking individuals who work every day trying to make the world a better, cleaner place by installing and delivering propane products to MA residences.

Our employees and DEP are on the same team. They and I all want clean air and clean water for our families and customers.

For years we have been considered the clean heating alternative to oil. Propane is made up of 73% Hydrogen (C3H8). Propane is a by-product of renewable fuels and conventional fuels. The more renewables that come on line……..the more propane will be produced, looking for a place to be utilized or just burned off. Propane has always been the solution for pollution. I firmly believe that propane should be eliminated from the CHS standard in MA. If not eliminated, we should be at least gaining credits like BIO-Fuel. We are cleaner than Bio in our current state. Renewable Propane blows it away as well as electricity in MA.

Only 8% of all households in Ma heat with propane. It is largely used in the suburbs where there is no natural gas available. Propane does not have methane emissions like natural gas. Why if we are a minority fuel is DEP targeting us like natural gas? Seems like a huge undertaking for such a clean, but not widely used fuel.

Propane companies need to remain robust in the commonwealth to help our residence weather the storms. Propane is the hero when power goes out and it gets cold. The public relies on the propane providers to keep the generators running during storms, keeping the food cooking, and keeping homes and families warm. If the CHS passes in its current form, bigger companies will become bigger by swallowing up the smaller ones. The paperwork and reporting will be a burden for most. The buying and selling of credits will not be a simple task and most will have to pay an aggregator to do the paperwork. The aggregator will be happy as he will be making money on the backs of others. (Interesting that the biggest aggregators Father was on the CHS team at DEP.) Eventually the industry will look like a utility company and the consumer will have less choices for suppliers.

Propane has and will be there for disasters. We cook the food when power is out for the Red Cross. We heated health stations during Covid testing as well as providing power and temporary heating when disaster strikes. Our people work 24/7 when things get tough. People rely on propane and our companies to get through hard times.

I applaud DEP for making our environment cleaner. DEP has helped our state tremendously over the years with wet land regulations, emissions from vehicles and various other initiatives. This one goes too far and beyond the scope of DEP's expertise. Penalizing propane and encouraging Bio-Heat is wrong and a travesty. We are cleaner and better for the environment. Isn't that what this is all about?

Thank you

Tim Johnson
Owner of Propane Plus
Rehoboth, Ma

January 2024

Department of Environmental Protection
100 Cambridge Steet,
Boston, MA 02114

Re: Massachusetts Clean Heat Standard - Draft Framework Comments
Sent via email: climate.strategies@mass.gov

Thank you for the opportunity to comment on the CHS draft framework. Our company, Propane Plus is a family owned small business, located in Rehoboth, Massachusetts. We have been serving families in Southeastern MA for over 30 years, we have a staff of 20 (Mainly MA residents), and we actively participate in communities all over MA.

We are concerned that MA DEP is making a mistake by not incentivizing the usage of propane in the Commonwealth. Prioritizing electric heat pumps, over cleaner propane systems will increase emissions in our state. We urge DEP to consider providing credits for geologic propane and treating it in the same manner as MA classifies renewable biomass. Propane is a beneficial by-product of natural gas processing and if it is not used it is wasted. As a waste product, it should be incentivized not only so that it will lower GHG emissions in MA, but also so that it will be available as a reliable affordable energy source for energy security during times or emergencies.

Today, geologic propane in MA has a carbon intensity of 77 which is less than the carbon intensity of electricity and heat pumps in MA which is 100 – 140 depending on how cold the winter is each year. Even if MA electricity becomes cleaner, it still makes no sense to disincentivize propane systems as the propane industry will continue to lower its carbon intensity with the addition of renewable propane blends. Our industry has a clean product, but we are not satisfied, and our goal in MA is to always have a lower carbon intensity than MA electricity and heat pumps. Thus, if MA DEP Is indeed trying to reduce carbon emissions today with a CHS, propane should simply be awarded clean heat credits.

The delivery of renewable propane and renewable propane blends should generate clean heat credits in all circumstances. Renewable propane should be explicitly designated as a qualifying biofuel. In order to incentivize innovation and increase the displacement of non-renewable thermal fuels, the definition of renewable fuels should be broadly defined and not narrowly tailored. Renewable propane is a by-product of renewable diesel production, and can be derived from a variety of sustainable sources, such as biomass, animal fats, and vegetable oils.3 At the point of combustion, renewable propane is carbon neutral because it's not releasing new carbon into the atmosphere. Renewable propane currently being used in California has a CI score as low as 21.4 This renewable propane is produced from non-rendered, used domestic cooking oil.

Not all combustion fuels are equal, and as a beneficial byproduct, propane is the exception to the stereotype. Propane is hydrogen rich, consisting solely of eight hydrogen and three carbon in its molecular state. Propane is a non-methane molecule. When released directly into the atmosphere in an uncombusted state, propane has an ozone depletion potential of zero, and a global warming potential of only 3.1 Propane, as a VOC, has a short atmospheric lifespan.2 This is different than methane or carbon dioxide. As an EPA alternative fuel propane is the perfect partner with wind and solar to reduce emissions in the thermal sector. Propane should be provided clean heat credits.

The underlying premise of the CHS is to reduce greenhouse gas (GHG) emissions. As such, the program should focus less on the type of energy to delivered – molecules or electrons – and more on the ability of any technology to immediately reduce GHG emissions from thermal applications. The current standards focus too much on electrification rather than decarbonization. A better framework would incentivize lower carbon intensive propane systems then the framework structure would focus on actual carbon reductions.

Finally, renewable propane should be incentivized in MA by DEP taking the lead to promote renewable propane development in the state. DEP could be leading the way and setting an example of how to reduce emissions while maintaining an equitable solution to energy security. MA must have backup energy for electricity outages and extreme weather events. Propane fills this role today as the backup fuel for generators across our state, and its use should be increased in the state to make sure we have environmental equity and affordability. MA must be conscious of the huge environmental impact of batteries and heavy metals. MA must not incentivize battery storage because doing so would be detrimental to the most vulnerable environmental justice populations on earth. We must not create more child labor and strip mining in the Republic of Congo and other developing countries. We have a clean solution in propane at our fingertips supported by local businesses like my own already in place that we should be incentivizing to make sure that we have a clean solution to energy security needs in our state.

Respectfully submitted,

**Tim Johnson**
**Owner**
**Propane Plus Corp.**
**177 Winthrop Street**
**Rehoboth, MA 02769**

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

RE: Clean Heat Standard Stakeholder Commentary #2

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My company sells deliverable fuels (heating oil, propane, biofuel, diesel, gasoline, 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.

I regretfully write this letter that after months of stakeholder input MA DEP has not addressed many of the basic questions provided in stakeholder comment or provided additional clarity on the workings of the MA CHS. Despite 300 plus pages of letters, many, many hours of testimony from stakeholders, and solutions being proposed, the MA DEP has yet to revise or even address any one of a number of holes in their proposed regulations.

For a regulation that will cost Massachusetts consumers in the estimated ***tens of billions of dollars*** the lack of study on the potential economic impact on MA consumers of these regulations is irresponsible. The lack of quantification of the actual climate impact these measures seek to mitigate is careless at best and at worst an ***intended omission.*** The fact is these regulations are still -un-qualified in terms of cost and questionable climate impact at this late stage of the proposal is unconscionable. The nonchalant way MA DEP is dealing with these foundational questions and others is frustrating to those who have dutifully participated in the stakeholder process, have asked for working formulas, processes or guidance on these issues over many months.

What MA DEP ***has clarified*** is the MA CHS proposing is an ***Electrify Everything Expensively with Heat Pumps*** regulation. The regulation is certainly not technology neutral as proposed by the CEPC. How does MA DEP propose this regulation with not only zero consideration of MA consumers but no discussion of increased demand for electricity, potential electrical generation shortfalls, electric grid capacity issues or a grid reliability study that details the increased cost for ratepayers to fund all this electrification. In addition, they also have not addressed the cost and availability of mechanical heat pumps, the skilled labor to install them, consumer's ability to pay for these mechanical upgrades nor a timetable for implementation for the MA CHS.

There has been a lot of talk in the CHS meetings about equity and justice for low income and BIPOC communities. As of the writing of this letter there has been zero cost estimate of these proposed regulations for these (or any) communities. That omission is a clear (and purposeful?) oversight when proposing this regulation as the cost to Massachusetts consumers is estimated to approach the $10's of billions over the course of a decade or so.

Deliverable fuel dealers in the state have been providing sustainable and affordable heating fuel to Massachusetts consumers for many decades. These small businesses have reacted to consumer demand about reducing carbon intensity and other greenhouse gases in the fuels that Massachusetts homes burn. They have implemented cleaner alternative fuels such as bioheat, biodiesel, renewable propane, renewable heating oil, low sulfur diesel. Most of these fuel-based carbon-reduction strategies are not all considered in the "CLEAN" Heat Standard. How does this happen?

The track record of deliverable fuel dealers in the state being environmentally friendly and reducing carbon impact over the many decades of being in business is something that we are all proud of. Massachusetts customers reward our small business with their loyalty and trust. For every boiler replacement, furnace upgrade, or thermostat replacement we have quantifiably demonstrated our commitment to reducing our customers' environmental and climate impact. We have made many of these mechanical efficiency improvements in Massachusetts homeowners' basements for decades. Keep in mind most of these initiatives were initiated by dealers themselves in order to serve their customers (the consumers of Massachusetts) with a more efficient sustainable, and affordable way to heat their homes. In our role as trusted home heating companies, we will continue to communicate to our customers that the MA CHS as written is a bad deal for them.

I get the feeling that MA DEP has been guided alone the most difficult path on purpose and has been advised to go out of its way to propose the most progressive regulations not only in the northeast but in the United States in order to meet the ticking due date of the MA Climate goals. MA CHS has a % carbon reduction goal per year over and above anything else proposed in the United States! Clearly, MA DEP (and its green policy wonks who attempt to advise regulators in multiple states) see MA consumers as their own guinea pig/test tube experiment for pushing climate-action agenda. It looks as if Massachusetts consumers will become the victim of MA DEP's inaction since 2008 and their attempt to solve for X by placing the burden of carbon reduction on the deliverable fuels industry and all MA consumers. I question whether parts of the MA CHS program that MA DEP has authored are even legal in regard to maintaining small business-competitiveness in the state.

It is not too late to change course! Listen to stakeholders and revise this revision of the MA CHS to something that looks like an actionable regulation and is in line with other states' laws on the books. There are many models out there and, any great proposals from stakeholders that MA DEP has (so far) failed to consider. Failure to do so will further delay implementation of MA CHS and will certainly not bring the state any closer to achieving its' climate goals.

In summary, the CHS regulations, as written, will 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. 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 study of 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,

Tim Johnson
Owner
Propane Plus Corp.

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

December 15, 2023

Dear Commissioner Heiple,

We are writing on behalf of Rewiring America, the leading electrification nonprofit working to help families and communities achieve energy efficiency, protect human health, and save money while reducing pollution. Thank you for the opportunity to comment on the [Draft Program Framework for the Clean Heat Standard (CHS)](). We applaud MassDEP for taking steps to develop ambitious regulations that will cut climate pollution, advance equity, and protect public health, and offer the following recommendations for your consideration.

**Recommendation 1: Water heating should be included in the Clean Heat Standard.** We were discouraged to see that the draft framework released in November 2023 did not mention water heating in its criteria for "full electrification." This is inconsistent with the Discussion Draft Regulations released in March 2023, which stated that heating fuel suppliers must include water heating in their emissions reporting.

One in six households in Massachusetts (17%) rely on propane or fuel oil to heat their water. This is highly correlated with delivered fuels for space heating, meaning the households who use a propane water heater are also using a propane furnace. To move away from these expensive and highly polluting fuels, both space and water heating must be targeted *together* through the Clean Heat Standard.

Bill savings are all but guaranteed for households that switch to a heat pump water heater — **we estimate that 98% of Massachusetts households that install a heat pump water heater would lower their energy bills, with an average annual savings of $245.**

The savings from switching to a heat pump water heater vary based on the household's existing fuel type: those currently using electric resistance would save $540, those using fuel oil or propane would save $264, and even households using natural gas would save $97 (Figure 1).

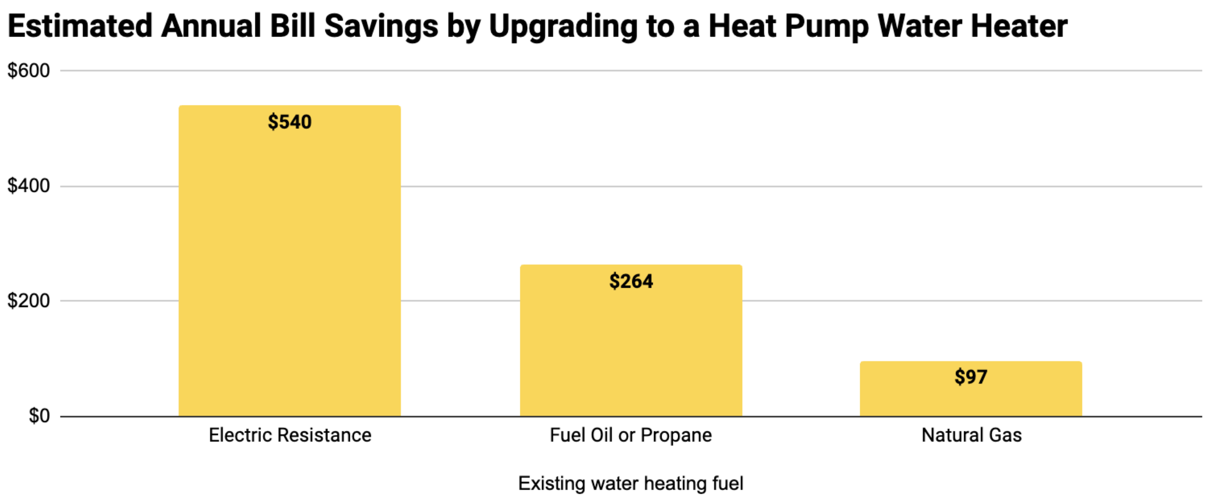


**Figure 1:** Annual average cost savings for Massachusetts households if they were to upgrade to a heat pump water heater from heating powered by electric resistance, delivered fuels (fuel oil or propane), or gas.

The fact is that any home relying on polluting fossil fuels to heat water is not fully electrified. MassDEP should allow heat pump water heaters to generate credits under the Early Registration Program, as well as any other credit-generating schemes under the Clean Heat Standard.[1] Including water heating in the Clean Heat Standard will drive households to upgrade both space and water heating simultaneously. Packaging these machines together will help lower costs for customers and enable the state to move away from delivered fuels.

Massachusetts [set a goal](#) of cutting 95% of carbon pollution from the Residential Heating and Cooling sector by 2050, and cannot rely on space heating alone to stay on track. To hit the state's climate targets, heat pump water heaters must make up

[1] Note, Vermont's Clean Heat Standard, the Affordable Heat Act, explicitly lists heat pump water heaters as an eligible measure to generate credits.

93% of sales by 2035, and 100% by 2050. Today, heat pump water heaters make up less than 1% of sales, while the rest are dominated by gas, electric resistance, propane, and oil (Figure 2). Upgrading from these polluting technologies to an electric heat pump water heater lets the average Massachusetts household avoid 865 kg of carbon pollution (CO2e) annually. The universal adoption of heat pump water heaters would lower Massachusetts' pollution by 2.2 million metric tons each year. By including water heating in the Clean Standard, Massachusetts can keep its climate goals within reach.

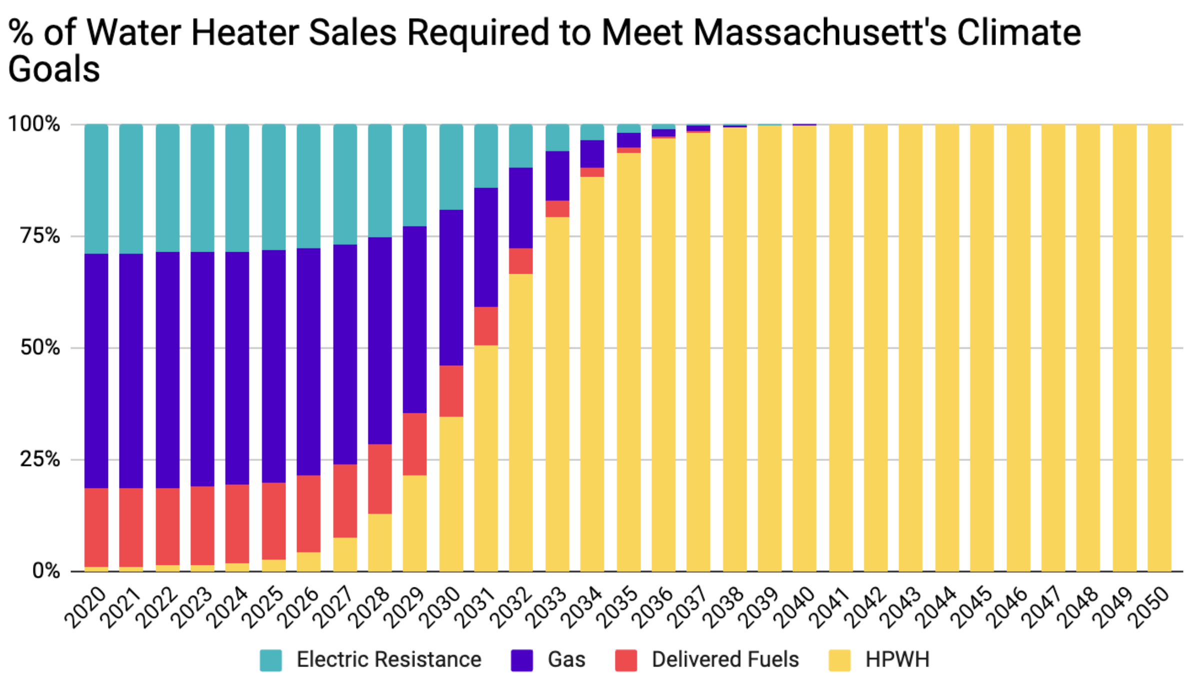


**Figure 2.** The pace of Massachusetts heat pump water heater sales needed to help achieve net zero carbon pollution by 2050

**<u>Recommendation 2: Projects should be sequenced based on the greatest operational cost savings.</u>** Targeting households that heat with propane, fuel oil, and/or electric resistance first will lead to the greatest cost savings. This will ensure the program has significant support and allow for learning and cost reductions as more contractors install heat pumps throughout the state. Implementing this recommendation may prove challenging, to the extent that most fuel providers are only serving one fuel. That said, we urge MassDEP to think about how targeting could be built into the program as it will ensure the program is successful and remains popular.

Particularly when natural gas households are targeted, it will be important to package space heating electrification with energy efficiency and weatherization to lower operational costs (Figure 3). It may be important to coordinate between this program and the Mass Save program to ensure that weatherization is part of the clean heat program. This will help ensure that electrification does not raise energy burdens for some households on natural gas who switch to HVAC heat pumps.

Upgrade Option: Enhanced Insulation

| | | | |
|---|---|---|---|
| **Average Bill Savings** | $946 | **Number of Households** | 2,045,626 |
| **Average kgCO2e Savings** | 2,894 | **Number of Households w/ Bill Savings** | 2,045,142 |
| **Average kWh Savings** | 11,312 | **Average Bill Savings for Households that Save** | $946 |

**Average Bill Savings by Baseline Fuel:**

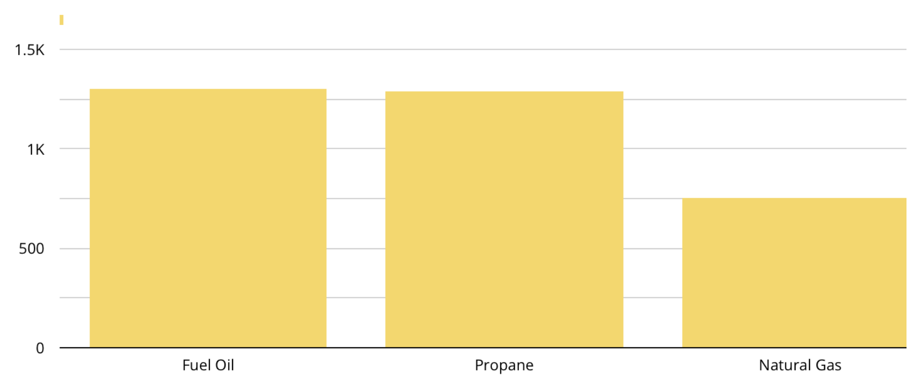


**Figure 3.** Annual bill savings from enhanced insulation in Massachusetts by current heating fuel.

**Recommendation 3: As electricity suppliers become obligated entities, upward pressure on electrification rates should be monitored closely.** We suggest further investigation is done to ensure electricity suppliers' obligation does not translate into higher electricity rates hindering the Commonwealth's goals for electrification. Rewiring America's analysis shows that a **one-cent reduction in electricity rates can reduce the lifetime operating cost for heat pump space heater owners by $1,445** over their average lifespan of fourteen years. Electricity rates can make or break the incentive for household electrification. For this reason, it's critical to ensure this program does not put upward pressure on rates, unintentionally undermining its electrification goals.

In conclusion, we strongly commend MassDEP for its pioneering efforts with the Clean Heat Standard. This program will combat climate change, foster financial savings for households, and pave the way for a more just and equitable future. We appreciate your thoughtful consideration of our recommendations and look forward to collaborating throughout the development of this critical program.

Sincerely,

Leah Stokes & Amanda Sachs
Rewiring America

The Commonwealth of Massachusetts
MASSACHUSETTS SENATE

SENATOR PATRICK M. O'CONNOR
*First Plymouth and Norfolk District*

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December 12, 2023

Commissioner Bonnie Heiple
Department of Environmental Protection
100 Cambridge St., Suite 900
Boston, MA 02114
Dear Commissioner Heiple,

First, I'd like to thank you for your tireless work in leading the Commonwealth's effort to protect our environment and combat climate change. I am writing during this public comment period to request that you, along with the Department of Environmental Protection (DEP) reconsider the implementation of the Clean Heat Standard (CHS).

I wholeheartedly agree that climate change is an emergency and should be addressed through every avenue we can find. However, the proposed CHS exclusively favors electrification, coming at the detriment of homeowners and the livelihoods of local small business owners in the energy space. Many of these small energy businesses have made significant investments in new energy solutions, such as Bioheat and other fuels that are scientifically proven to reduce greenhouse gas emissions. We should look to provide homeowners with as many sustainable energy options as possible, ensuring a reasonable price point for customers and multiple paths forward for energy companies.

A strategy that heavily favors electrification has its own shortcomings. Overreliance on our already fragile electrical grid not only poses a massive risk of outages, but will require additional natural gas to meet the demand. Burning more natural gas to support electrification is counterproductive to the mission of this initiative: reducing greenhouse gas emissions. Further, this CHS will put heavier strains on manufacturers of heat pumps and the persisting labor shortage in the trades, leading to even longer delays in installation. According to Curtis Dubay, Chief Economist at the US Chamber of Commerce, "We're going to have a persistent worker shortage for the foreseeable future," CEO of the Greater Boston Chamber of Commerce agreed that we are in a nation-wide talent shortage. Limiting ourselves to electrification and heat pumps will only exacerbate these issues, whereas maintaining a variety of options will alleviate this crisis. Without a wide variety of clean heat options, these elements will combine to create a significant logistical hurdle in this transition.

We have the shared goal of finding the best solutions for reducing greenhouse gas emissions and mitigating the effects of climate change. This is an endeavor that will require continued innovation and open-mindedness. In order to best secure a smooth transition toward a greener future, we must provide as many options as we can for homeowners.

I respectfully ask for your consideration of a plan that's more inclusive to Bioheat and other clean fuels, for the good of homeowners, local small energy companies, and the environment. If you have any questions, please do not hesitate to contact me directly.

Sincerely,

**PATRICK M. O'CONNOR**
State Senator
First Plymouth & Norfolk District

December 19, 2023
Submitted via email to climate.strategies@mass.gov

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

**RE: SRECTrade Comments on Draft CHS Framework – December 2023**

Dear Massachusetts Department of Environmental Protection Clean Heat Standard Team,

Thank you for the opportunity to provide feedback on the draft program framework for the Massachusetts Clean Heat Standard (CHS). SRECTrade applauds the recognition of aggregators in facilitating participation in credit trading programs and encourages MassDEP to consider establishing clear guidelines, roles, and processes for aggregators to support the CHS upon its initialization, including for any early action crediting programs that may be established.

SRECTrade recommends the following strategies to ensure that aggregators can adequately support the CHS:

- Define and establish a role for aggregators that is distinct from Authorized Agents (as defined in the November 2023 Draft Regulation). Where Authorized Agents are likely to be equipment installers who interface directly with and take ownership of credits from property owners, aggregators would instead interact with Authorized Agents to facilitate registration, credit generation, and credit monetization. Aggregators do not need to take ownership of credits, but mechanisms should be developed for Authorized Agents to authorize aggregators to act on their behalf.
- Enable aggregators to manage multiple project registration, credit generation, and credit transfer activities within a single Clean Heat and Emissions Tracking System (CHETS) account. Creating aggregator accounts will limit the number of CHETS accounts that need to be created, monitored, and individually administered.
- Allow third parties to develop software tools that can integrate with CHETS using application programming interfaces (APIs). APIs have been effectively used within environmental credit trading programs to streamline administrative and user functions such as submitting and reviewing project applications. This feature will be critical for aggregators, regulatory staff, and other program participants managing hundreds or thousands of applications.

SRECTrade appreciates the opportunity to provide feedback on the CHS and looks forward to continued engagement with MassDEP.

Sincerely,

Evan Rosenberg
Director, Strategy and Business Development
SRECTrade, Inc.
(415) 651-7781
Evan.Rosenberg@SRECTrade.com

About SRECTrade

*SRECTrade provides management and transaction services for renewable energy and clean fuel programs across North America. SRECTrade's parent company, Xpansiv, provides market infrastructure to rapidly scale the world's energy transition. Xpansiv operates CBL, the largest spot exchange for environmental commodities, including carbon credits and renewable energy certificates.*

Go Green with
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Paul M. Rozenberg
Senior Manager
Government Affairs & Corporate Communications

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(p) 973.503.9915
(c) 862.217.9643

December 21, 2023

**<u>VIA ELECTRONIC MAIL</u>**
Massachusetts Department of Environmental Protection
100 Cambridge Street, Suite 900
Boston, MA 02114

***RE: Clean Heat Standard Framework***

Dear Sir/Madam:

Suburban Propane writes with regard to the draft framework for the Clean Heat Standard (CHS). As the nation's third-largest propane retailer with operations in 42 states, Suburban Propane has served customers for more than 95 years. In Massachusetts, we currently have more than 40 employees at 8 locations and approximately 15,000 customers.

Suburban Propane supports the Commonwealth's overall goal of reducing the carbon footprint of buildings. However, pushing full electrification is not an effective way to achieve this goal. Combatting the impacts of climate change is achievable only if Massachusetts adopts a technology-neutral approach and uses all available tools at its disposal, including clean, low-carbon energy such as traditional propane, renewable propane, and renewable dimethyl ether. Therefore, we ask that the CHS framework be amended to promote a technology-neutral approach encouraging the adoption of the least carbon intense energy source to achieve the Commonwealth's goal of reducing greenhouse gas emissions.

As currently drafted, the CHS expressly prioritizes electricity by dividing the program into two standards: one for full electrification residential projects and one for emissions reduction. However, neither is effective at reducing emissions. With respect to the full electrification standard, the CHS's ultimate goal should be the continual reduction of carbon emissions from buildings, not the adoption of a particular technology. It is inaccurate to assume that electricity is the energy source with the lowest carbon intensity (CI). Electricity can be a tool in reducing the carbon footprint of buildings, but rapid electrification is detrimental to decarbonization. If buildings move to all-electric too quickly, it further taxes an already overburdened electrical grid and leads to increasing electricity costs for residents.

The emissions reduction standard will also be ineffective and costlier to consumers, as it is not technology-neutral. Currently, only three type of actions qualify for crediting: full electrification projects; installation of hybrid systems that retain a fossil backup; and the documented delivery of eligible liquid biofuels, which count toward compliance obligations of heating oil suppliers. Other low-carbon fuels will not be considered, regardless of CI score, until after a 2028 program review. This drastically limits the types of low-carbon fuels eligible for credits, even if those fuels are less carbon-intense than the electric grid, including propane.[1] Further, it requires consumers to pay exorbitant costs to convert their heating systems. For example, renewable propane is a drop-in fuel for traditional propane customers, allowing them to use a very low-CI fuel with the pre-existing infrastructure, saving customers thousands of dollars in conversions. However, renewable propane is ineligible under the current framework, leaving a potential carbon emissions reduction tool unused, forcing consumers to pay to converting their heating systems.

Instead of relying solely on electricity, we encourage the Commonwealth to adopt a technology-neutral approach to reducing carbon emissions, similar to the clean fuel standards adopted in California, Oregon, and Washington for transportation emissions, and permit the use of other energy sources that are low-carbon, including traditional and renewable propane, and blends of propane with renewable dimethyl ether (rDME). Propane is a reliable and abundant energy source that millions of households and businesses use for heating, cooking, and other purposes. Rural communities, like many of the communities in much of the Commonwealth, rely solely on propane as they do not have access to natural gas lines.

Suburban Propane is proud to be leading the propane industry in the energy transition to a low-carbon world. Through our Suburban Renewables platform, we are committed to investing in the next generation of even cleaner, less carbon-intensive energy sources, such as renewable propane, rDME, biogas, renewable natural gas, and hydrogen. However, it will take time to bring these new products to widespread commercial scale and the use of clean propane will be important in reducing emissions in the short term.

We urge the Department to amend the CHS by adopting a technology-neutral approach making all low-carbon, carbon-neutral, or carbon-negative energy sources eligible for crediting. We would appreciate the opportunity to further discuss how propane, renewable propane, and other low-carbon fuels can play a role in lowering the carbon footprint of buildings in Massachusetts. Thank you for your consideration.

Sincerely,

/s/ Paul M. Rozenberg

Paul M. Rozenberg
Sr. Manager, Government Affairs &
Corporate Communications
Suburban Propane

[1] Analyzing the lifecycle of a fuel, propane is estimated to have a CI score of 77 in Massachusetts, while the Commonwealth's electric grid has an estimated CI score of 100.

60 SHUMWAY STREET
AMHERST, MA 01002
(413) 253-5999

SURNER
HEATING CO., INC.

34 MONTAGUE CITY ROAD
GREENFIELD, MA 01301
(413) 773-5999

January 2024

Department of Environmental Protection
100 Cambridge Steet,
Boston, MA 02114

Re: Massachusetts Clean Heat Standard -

Thank you for the opportunity to comment on the CHS draft framework. **Our company, Surner Heating, is a family-owned small business who has been supporting Hampshire and Franklin Counties in Massachusetts for over SIXTY years. Due to the rural location of our customers, we truly have been providing energy security for many of the hill towns, and to our farmers as well. We employ 35 people, many who have been with us for most of their adult careers.**

We are concerned that MA DEP is making a mistake by not incentivizing the usage of propane in the Commonwealth. Prioritizing electric heat pumps over cleaner propane systems will increase emissions in our state. We urge DEP to consider providing credits for geologic propane and treating it in the same manner as MA classifies renewable biomass. Propane is a beneficial by-product of natural gas processing and if it is not used it is wasted. As a waste product, it should be incentivized not only so that it will lower GHG emissions in MA, but also so that it will be available as a reliable affordable energy source for energy security during times or emergencies.

Today, geologic propane in MA has a carbon intensity of 77 which is less than the carbon intensity of electricity and heat pumps in MA which is 100 – 140 depending on how cold the winter is each year. Even if MA electricity becomes cleaner, it still makes no sense to disincentivize propane systems as the propane industry will continue to lower its carbon intensity with the addition of renewable propane blends. Our industry has a clean product, but we are not satisfied, and our goal in MA is to always have a lower carbon intensity than MA electricity and heat pumps. Thus, if MA DEP Is indeed trying to reduce carbon emissions today with a CHS, propane should simply be awarded clean heat credits.

**The underlying premise of the CHS is to reduce greenhouse gas (GHG) emissions. As such, the program should focus less on the type of energy to be delivered- molecules or electrons- and more on the ability of any technology to immediately reduce GHG emissions from thermal applications. The current standards focus too much on electrification rather than decarbonization. A better framework would incentivize lower carbon intensive propane systems, then the framework structure would focus on actual carbon reductions.**

Finally, renewable propane should be incentivized in MA by DEP taking the lead to promote renewable propane development in the state. DEP could be leading the way and setting an example of how to reduce emissions while maintaining an equitable solution to energy security. MA must have backup energy for electricity outages and extreme weather events. Propane fills this role today as the backup

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AMHERST, MA 01002
(413) 253-5999

SURNER
HEATING CO., INC.

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fuel for generators across our state, and its use should be increased in the state to make sure we have environmental equity and affordability. MA must be conscious of the huge environmental impact of batteries and heavy metals. MA must not incentivize battery storage because doing so would be detrimental to the most vulnerable environmental justice populations on earth. We must not create more child labor and strip mining in the Republic of Congo and other developing countries. We have a clean solution in propane at our fingertips supported by local businesses like my own already in place that we should be incentivizing to make sure that we have a clean solution to energy security needs in our state.

Respectfully submitted,

**Susan Surner**
**Owner**
**Surner Heating Co.**
**60 Shumway St.- Amherst**
**34 Montague City Rd. Greenfield**

January 18, 2024

Department of Environmental Protection

100 Cambridge Street, Boston, MA 02114

Re: Massachusetts Clean Heat Standard

Sent via email: climate.strategies@mass.gov

Thank you for the opportunity to comment on the CHS draft framework. Our company, Tasse's Fuel, has been a family-owned small business for over 75 years, and we are in Southbridge, Massachusetts. Tasse's Fuel purchased another company, Crowley Fuel, in North Brookfield, MA, in 2017. Crowley Fuel is over 100 years old. Tasse-Crowley Fuel is well known and respected in each of its surrounding towns. We do our best to treat our customers with care and respect. There are 24 full-time employees and three seasonal/part-time employees. We operate in the Central part of MA and Northern parts of CT. We deliver from Oakham, MA, to Pomfret, CT, Ware, MA, Oxford, MA, and many other towns in between. We take care of customers in over 35 surrounding towns.

We are concerned that MA DEP is making a mistake by not incentivizing the usage of propane in the Commonwealth. Prioritizing electric heat pumps over cleaner propane systems will increase emissions in our state. We urge DEP to consider providing credits for geologic propane and treating it in the same manner as MA classifies renewable biomass. Propane is a beneficial by-product of natural gas processing, and if it is not used, it is wasted. As a waste product, it should be incentivized not only so that it will lower GHG emissions in MA. but also so that it will be available as a reliable, affordable energy source for energy security during times of emergencies.

Today, geologic propane in MA has a carbon intensity of 77 which is less than the carbon intensity of electricity and heat pumps in MA which is 100 – 140 depending on how cold the winter is each year. Even if MA electricity becomes cleaner, it still makes no sense to disincentivize propane systems as the propane industry will continue to lower its carbon intensity with the addition of renewable propane blends. Our industry has a clean product, but we are not satisfied, and our goal in MA is to always have a lower carbon intensity than MA electricity and heat pumps. Thus, if MA DEP Is indeed trying to reduce carbon emissions today with a CHS, propane should simply be awarded clean heat credits.

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MA must have backup energy for electricity outages and extreme weather events. Propane fills this role today as the backup Fuel for generators across our state, and its use should be increased in the state to make sure we have environmental equity and affordability. MA must be conscious of the huge environmental impact of batteries and heavy metals. MA must not incentivize battery storage because doing so would be detrimental to the most vulnerable environmental justice populations on earth. We must not create more child labor and strip mining in the Republic of Congo and other developing countries. We have a clean solution in propane at our fingertips supported by local businesses like my own already in place that we should be incentivizing to make sure that we have a clean solution to energy security needs in our state.

Respectfully submitted,

Diane Banfield

CSR/Billing

Tasse's Fuel Corp.

37 Hook Street, Southbridge, MA 01550

Tasse's
PREMIUM FUELS & HOME COMFORT SOLUTIONS.
www.tasses.com 508.765.0841

January 17, 2024

Department of Environmental Protection
100 Cambridge Steet,
Boston, MA 02114

Re: Massachusetts Clean Heat Standard - Draft Framework Comments
Sent via email: climate.strategies@mass.gov

Thank you for the opportunity to comment on the CHS draft framework. **Our company, Tasse Fuel Corporation, is a 3rd generation family owned small business located in Southbridge, Massachusetts. We were founded by the owner's grandfather in 1949 and have been a vital part of this community. In 2017 we expanded by purchasing Crowley Fuel in North Brookfield. This year we installed a propane bulk plant in Brookfield, MA where we will move all our offices later this year. Currently we have around 30 full time and part time employees. We are located in central mass and service a large number of towns.**

We are concerned that MA DEP is making a mistake by not incentivizing the usage of propane in the Commonwealth. Prioritizing electric heat pumps, over cleaner propane systems will increase emissions in our state. We urge DEP to consider providing credits for geologic propane and treating it in the same manner as MA classifies renewable biomass. Propane is a beneficial by-product of natural gas processing and if it is not used it is wasted. As a waste product, it should be incentivized not only so that it will lower GHG emissions in MA, but also so that it will be available as a reliable affordable energy source for energy security during times or emergencies.

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The delivery of renewable propane and renewable propane blends should generate clean heat credits in all circumstances. Renewable propane should be explicitly designated as a qualifying biofuel. In order to incentivize innovation and increase the displacement of non-renewable thermal fuels, the definition of renewable fuels should be broadly defined and not narrowly tailored. Renewable propane is a by-product of renewable diesel production, and can be derived from a variety of sustainable sources, such as biomass, animal fats, and vegetable oils.[1] At the point of combustion, renewable propane is carbon neutral because it's not releasing new carbon into the atmosphere.

---

Tasse's
PREMIUM FUELS & HOME COMFORT SOLUTIONS.
www.tasses.com 508.765.0841

Renewable propane currently being used in California has a CI score as low as 21.[2] This renewable propane is produced from non-rendered, used domestic cooking oil.

The underlying premise of the CHS is to reduce greenhouse gas (GHG) emissions. As such, the program should focus less on the type of energy to delivered – molecules or electrons – and more on the ability of any technology to immediately reduce GHG emissions from thermal applications. The current standards focus too much on electrification rather than decarbonization. A better framework would incentivize lower carbon intensive propane systems then the framework structure would focus on actual carbon reductions.

Beyond electrification and the delivery of qualifying biofuels, the delivery of conventional propane, in certain situations, should generate clean heat credits. This should include the conversion of households that previously relied on fuel, kerosene, or coal. Retiring these thermal sources in favor of propane would immediately reduce carbon emissions and improve local air quality. The CHS must recognize that different combustion fuels have different properties and environmental impacts. In Massachusetts, more than 650,000 households use fuel oil, kerosene, or coal as their primary space heating fuel.[3] Propane has a $CO_2$ coefficient, per million Btu of energy, that is 16% lower than fuel oil, 15% lower than kerosene, and 41% lower than coal.[4] Converting these households to propane should generate clean heat credits.

Finally, renewable propane should be incentivized in MA by DEP taking the lead to promote renewable propane development in the state. DEP could be leading the way and setting an example of how to reduce emissions while maintaining an equitable solution to energy security. MA must have backup energy for electricity outages and extreme weather events. Propane fills this role today as the backup fuel for generators across our state, and its use should be increased in the state to make sure we have environmental equity and affordability. MA must be conscious of the huge environmental impact of batteries and heavy metals. MA must not incentivize battery storage because doing so would be detrimental to the most vulnerable environmental justice populations on earth. We must not create more child labor and strip mining in the Republic of Congo and other developing countries. We have a clean solution in propane at our fingertips supported by local businesses like my own already in place that we should be incentivizing to make sure that we have a clean solution to energy security needs in our state.

Respectfully submitted,

**Lisa Moseley**
**Bookkeeper**

[1] *Propane Production and Distribution*, Alternative Fuels Data Center, U.S. Department of Energy, https://afdc.energy.gov/fuels/propane_production.html

[2] *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

[3] *Selected Housing Characteristics – Household Heating Fuel*, American Community Survey, U.S. Census Bureau, (2022), https://data.census.gov/table/ACSDP5Y2022.DP04?g=040XX00US25

[4] *Carbon Dioxide Emissions Coefficients*, U.S. Energy Information Administration, (September 7, 2023), https://www.eia.gov/environment/emissions/co2_vol_mass.php

Tasse's

PREMIUM FUELS & HOME COMFORT SOLUTIONS.

www.tasses.com 508.765.0841

## Parnay, Angela L (DEP)

**From:** Tawnya Enselek <tawnya@tasses.com>
**Sent:** Wednesday, January 17, 2024 11:34 AM
**To:** Strategies, Climate (DEP)
**Subject:** Massachusetts Clean Heat Standard



Tasse's OIL & PROPANE
CROWLEY FUEL

January 17, 2024

Department of Environmental Protection

100 Cambridge Street, Boston, MA 02114

Re: Massachusetts Clean Heat Standard

Sent via email: climate.strategies@mass.gov

Thank you for the opportunity to comment on the CHS draft framework. Our company, Tasse's Fuel, has been a family-owned small business for over 75 years, and we are in Southbridge, Massachusetts. Tasse's Fuel purchased another company, Crowley Fuel, in North Brookfield, MA, in 2017. Crowley Fuel is over 100 years old. Tasse-Crowley Fuel is well known and respected in each of its surrounding towns. We do our best to treat our customers with care and respect. There are 24 full-time employees and three seasonal/part-time employees. We operate in the Central part of MA and Northern parts of CT. We deliver from Oakham, MA, to Pomfret, CT, Ware, MA, Oxford, MA, and many other towns in between. We take care of customers in over 35 surrounding towns.

We are concerned that MA DEP is making a mistake by not incentivizing the usage of propane in the Commonwealth. Prioritizing electric heat pumps over cleaner propane systems will increase emissions in our state. We urge DEP to consider providing credits for geologic propane and treating it in the same manner as MA classifies renewable biomass. Propane is a beneficial by-product of natural gas processing, and if it is not used, it is wasted. As a waste product, it should be incentivized not only so that it will lower GHG emissions in MA. but also so that it will be available as a reliable, affordable energy source for energy security during times of emergencies.

Today, geologic propane in MA has a carbon intensity of 77 which is less than the carbon intensity of electricity and heat pumps in MA which is 100 – 140 depending on how cold the winter is each year. Even if MA electricity becomes cleaner, it still makes no sense to disincentivize propane systems as the propane industry will continue to lower its carbon intensity with the addition of renewable propane blends. Our industry has a clean product, but we are not satisfied, and our goal in MA is to always have a lower carbon intensity than MA electricity and heat pumps. Thus, if MA DEP Is indeed trying to reduce carbon emissions today with a CHS, propane should simply be awarded clean heat credits.

Finally, renewable propane should be incentivized in MA by DEP taking the lead to promote renewable propane development in the state. DEP could be leading the way and setting an example of how to reduce emissions while maintaining an equitable solution to energy security. MA must have backup energy for electricity outages and extreme weather events. Propane fills this role today as the backup Fuel for generators across our state, and its use should be increased in the state to make sure we have environmental equity and affordability. MA must be conscious of the huge environmental impact of batteries and heavy metals. MA must not incentivize battery storage because doing so would be detrimental to the most vulnerable environmental justice populations on earth. We must not create more child labor and strip mining in the Republic of Congo and other developing countries. We have a clean solution in propane at our fingertips supported by local businesses like my own already in place that we should be incentivizing to make sure that we have a clean solution to energy security needs in our state.

*Sincerely,*

*Tawnya M Enselek*
*Credit/Collections, CSS*
*Tasse's Fuel Corporation*
*37 Hook Street, Southbridge, MA 01550*
*508-765-0841*
*tawnya@tasses.com*

***The sun is always shining, just some days you need to look through the clouds***

VANGUARD RENEWABLES

vanguardrenewables.com

133 Boston Post Road
Building 15
Weston, MA 02493

781.232.7597

December 19, 2023

Bonnie Heiple, Commissioner
Massachusetts Department of Environmental Protection
100 Cambridge Street, Suite 900
Boston, MA 02114
Sent Via E-Mail

**Feedback on Draft Clean Heat Standard Framework**

Dear Commissioner Heiple,

Vanguard Renewables submits the following comments in response to Massachusetts Department of Environmental Protection's (DEP) recent Draft Clean Heat Standard (CHS) Framework.[1] Vanguard Renewables build owns and operates farm-based anaerobic digesters across the Commonwealth and the nation to produce renewable natural gas and renewable electricity. We are based in Massachusetts with five anaerobic digesters on Massachusetts family dairy farms as well as a mechanical depackaging facility in Agawam.

Vanguard Renewables supports the development of a Clean Heat Standard as an important policy for decarbonizing Massachusetts existing building stock, including where fossil fuels are currently used to supply gaseous and liquid end-uses. The Commonwealth is right to prioritize emissions reductions from the built environment immediately given its prominence as an emissions source and the complexity of eliminating those emissions.

With this in mind, we are extremely surprised and concerned that the Draft CHS Framework does not include any crediting for renewable gaseous fuels as part of Massachusetts' building decarbonization solution. This decision intentionally ignores renewable gas technologies which are available today and are proven to provide multi-sector GHG reduction and other environmental benefits. **We are simply requesting that renewable gases be included alongside other fuels in Massachusetts Clean Heat Standard program.**

*Massachusetts Must Develop a Strategy Surrounding the Role of Renewable Gas*

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

[1] https://www.mass.gov/doc/chs-draft-program-framework/download

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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. As described in comments previously submitted by the Coalition for Renewable Natural Gas,[2] this is a widely accepted strategy supported by ample data and understanding of the benefits of these fuels from a GHG accounting standpoint. Leading climate jurisdictions have programs which support the use of renewable gas across sectors.

The exclusion of renewable gases appears to be based on the assumption that end-use electrification is the only necessary solution for full gas sector decarbonization, and that it will occur quickly. Both assumptions are clearly false based on any given projected decarbonization scenario in any state.[3] Indeed, the portions of the gas system which currently serve the residential and commercial customers targeted for electrification will remain in place for a very long time, even with aggressive fuel-switching policies, and would be well-served by renewable gases while that transition occurs. Using renewable gases in these end-uses does not preclude other measures of reducing fossil gas consumption such as electrification or energy efficiency.

Most importantly, renewable gases will remain a long-term necessary component of any decarbonization strategy, including where renewable gases and molecules will continue to be needed in certain sectors.[4] The Clean Heat Standard provides a means to continue to scale these technologies and realize their environmental benefits now.

Furthermore, recycling waste into circular fuel and platform molecules via anaerobic digestion is expected to continue to be a primary strategy for meeting Massachusetts' food waste diversion goals.[5] This technology is widely substantiated by Vanguard Renewables ranging from the Biden Administrations recent food waste recycling and methane reduction plan[6] to Denmark's successful organic waste and renewable gas strategies.[7] Excluding renewable gases

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[2] See previous comments from Coalition for Renewable Natural Gas, titled "Initial Stakeholder Input on the Role of Renewable Gas in a Massachusetts Clean Heat Standard".

[3] We are not aware of any GHG reduction or energy systems pathways analysis which concludes that residential and commercial electrification will move quickly enough to negate the near-term role of renewable gas.

[4] See previous RNG Coalition comments for explanation. Similar to footnote 3, no strategy shows full end-use electrification across all sectors of the economy as possible or desirable from a system optimization standpoint.

[5] https://www.mass.gov/doc/massachusetts-organics-action-plan-november-2023/download#:~:text=The%20Master%20Plan%20established%20a,tons%20of%20food%20waste%20reduction.

[6] https://www.epa.gov/newsreleases/biden-harris-administration-releases-draft-national-strategy-reduce-food-loss-and

[7] https://ens.dk/sites/ens.dk/files/Naturgas/groen_gasstrategi_en.pdf

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from the program removes an incentive on the table to do so. We believe that strict enforcement of the Commonwealth's 2014 organics landfill ban could create significant renewable resources for Massachusetts and address the methane sequestration goals espoused at COP28.

*Conclusion*

Vanguard Renewables fully supports the implementation of a CHS in Massachusetts as an important tool for meeting the Commonwealth's thermal decarbonization goals. However, the exclusion of renewable gas from this program would be a major missed opportunity for near-term cross-sector decarbonization and the creation of supply capacity and infrastructure which is expected to play a key role in decarbonizing the economy. With this in mind, we urge DEP to include renewable gases—with specific attention to RNG—alongside liquid biofuels in the forthcoming CHS and to enforce the organics to landfill law.

Sincerely,

Neil H. Smith

Neil H. Smith, Chief Executive Officer
Vanguard Renewables

Despite the recommendations from the MA Clean Heat Commission's consultants and MassDEP's own memos to include pathways for decarbonizing the gas side, MassDEP is proposing only electrification and liquid fuels earn clean heat credits starting in 2025 with a program reevaluation in 2028 for other fuel pathways.

MassDEP cites fuel availability as one of the items for inclusion even though there is not enough renewable liquid biofuel according to the dealers. There is sufficient RNG as demonstrated by National Grid's RFI. It takes policy and incentives to steer it here. Vergent knows the RNG supply landscape in the region and we can confidently say there is at least as much RNG available as renewable liquid biofuel in the APS program currently. The fuel is available now so the state can claim immediate CO2 reductions rather than waiting on the grid to have meaningful reductions which may or may not happen.

MassDEP also cites cost as a factor although they share no cost data nor a comparison with other pathways on a similar metric like cost per ton of CO2 removed. Most RNG is approximately $200-300/ton on a cost per ton of CO2 removed on a lifecycle emissions basis. What is the amount for heat pumps running on 100% renewable electricity? Where are the comparisons?

MassDEP also cites uncertainty of RNG emission reductions. MassDEP need only look at the California Air Resource Board's (CARB's) work on quantifying emission reductions on a lifecycle basis. CARB calculates the carbon intensity of their grid as well and it has not decreased measurably even with similar renewable penetration and goals as MA.

In summary what is the harm in letting in other technologies now to improve our air quality? RNG is available now, it is cost-effective and can have meaningful reductions. The RNG developers will decide if the clean heat credit and MA market is sufficient enough when looked at on lifecycle emissions basis to steer their RNG to MA or not.

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

**By Electronic Submission:** Bonnie.Heiple@mass.gov

**RE: Clean Heat Standard – District Energy Eligibility**

Dear Commissioner Heiple,

Thank you for your time last week to meet with the Vicinity team. We greatly appreciate the opportunity to introduce ourselves, to share our electrification plan, how we can support decarbonization efforts, and why our heat pump should be considered for eligibility to receive clean heat credits in the Clean Heat Standard (CHS). We look forward to continuing participating in future virtual community and technical sessions hosted by the Massachusetts Department of Environmental Protection (MassDEP) team and hope that this is the beginning of many more discussions. As an energy provider, we fully support Governor Healey's vision on building a thriving and sustainable Commonwealth. We are excited to be a partner in the effort to reduce greenhouse gas emissions (GHG) in the communities we serve.

As we presented during our meeting, the electrification of our district energy system involves implementing three distinct technologies: an electric boiler (eboiler), an industrial-scale heat pump, and thermal storage. The installation of our eboiler is currently underway at our Kendall plant. Once operational, this will enable us to offer our customers in Boston and Cambridge our 100% renewable and carbon-free thermal energy product, eSteam™. This initiative not only aligns with our commitment to sustainability but also ensures compliance with local regulations for our customers.

Our next initiative is the installation of a heat pump complex along the Charles River. Vicinity strongly recommends that MassDEP incorporates incentives for heat pumps within the CHS program, allowing industrial-scale heat pumps to qualify for clean heat credits. Aligned with the CHS objective of minimizing climate pollution and shifting from fossil fuels, the inclusion of incentives will promote the adoption of technologies that markedly reduce emissions in the Commonwealth. Vicinity advocates for a "technology-neutral" approach, supporting the eligibility of all emission-reducing measures, including industrial-scale heat pumps, for generating clean heat credits within the CHS. This would not only incentivize district energy systems, but also colleges and universities, manufacturing plants, hospitals, and health centers among other large campus systems.

At the last virtual meeting, MassDEP mentioned that the CHS would draw upon the APS and other existing programs and initiatives to uphold credit integrity. Vicinity expresses support for this initiative but suggests that MassDEP consider a few factors. Presently, the APS outlines the eligibility criteria for large water-source heat pumps to participate in the program and the methods for earning APS credits. However, as currently written, it inadvertently excludes the consideration of the most sizable and efficient industrial heat pump complexes. MassDEP has the chance to include language that explicitly recognizes an industrial-scale heat pump, including a high-temperature heat pump, as a qualifying heat source.

Moreover, it is crucial that if the Alternative Energy Credits (AEC) currently accessible within the APS program are phased out, a seamless transition from AEC to the CHS should be contemplated for existing AEC program beneficiaries. Vicinity recommends the Commonwealth create a platform that offers at least equivalent value to current AEC participants and ensures a smooth adjustment in credit valuation during the phase-out of one program and the implementation of the other.

Vicinity acknowledges that a program review of the CHS will be conducted in 2028 to evaluate eligibility into the CHS program. However, we strongly urge MassDEP to not delay the consideration of including district energy systems into the CHS program until then. With our current plans, we will be able to support many buildings in Boston and Cambridge to decarbonize and further accelerate the Commonweath's GHG emissions reduction goals. District energy should be included in the CHS as a valuable tool to be relied on by the Commonwealth to achieve its 2050 net zero GHG emissions goal. As proven in Europe, district energy systems can be electrified to quickly decarbonize the heating and cooling profile of all connected buildings and should be considered a pivotal means to quickly decarbonize dense urban environments.

We thank you and your team for taking time from your busy schedules to meet with us. We hope that this is the beginning of many more discussions and look forward to being a partner in the work ahead.

Sincerely,

Kevin Hagerty
President, Deputy CEO

Matthew O'Malley
Chief Sustainability Officer

**CC:** climate.strategies@mass.gov
Christine Kirby, Assistant Commissioner, Bureau of Air and Waste: Christine.Kirby@mass.gov
John Beling, Deputy Commissioner for Policy and Planning: John.D.Beling@mass.gov
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William Space, Environment Analyst: William.Space@mass.gov
Helena Boccadoro, Program Coordinator: Helena.Boccadoro@mass.gov

December 21, 2023

**BY ELECTRONIC SUBMISSION:** climate.strategies@mass.gov

**RE: Clean Heat Standard Program Design Framework**

Vicinity Energy Inc. (Vicinity) has actively engaged in virtual community and technical sessions hosted by the Massachusetts Department of Environmental Protection (MassDEP) and provided comments during the initial presentation of the Clean Heat Standard (CHS). We are pleased to provide additional comments to inform the development of a proposed CHS. We applaud Commissioner Bonnie Heiple and MassDEP staff for their continued commitment to achieve an economy-wide reduction of greenhouse gas emissions (GHG) in Massachusetts. As an energy provider, we stand shoulder to shoulder with the Commonwealth in reaching and surpassing Governor Maura Healey's decarbonization goals.

As the objective of the CHS is to promote and encourage the transition away from gas, oil and propane and move toward the adoption of clean heat options and technologies, Vicinity strongly encourages MassDEP to include carbon-free thermal energy distributed by a district energy system as a clean heat pathway for non-residential commercial buildings and, as described below, to include district energy systems as qualifying resources to receive clean heat credits (CHC) for the reduction of GHG emissions in Massachusetts.

**Background**

Vicinity currently operates a combined heat and power (CHP) plant in Cambridge (Kendall Station), generating electricity delivered to the grid alongside co-generated thermal energy. Vicinity supplies thermal energy to over 230 buildings and more than 70 million square feet of space in Boston and Cambridge. This thermal energy is used to heat 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 our number one priority as we transition to a decarbonized future.

**eSteam™**

The backbone of Vicinity's decarbonization plan is to electrify our operations by generating steam using electric boilers (eboilers) and installing a heat pump complex along the Charles River. These technologies will allow us to procure renewable electricity from the grid as our primary fuel source. Not only was our first eboiler was delivered to Kendall Station in November, but the interconnection process is well underway and the eboiler will be operational by mid 2024. Our revolutionary product, eSteam™, will be available to customers by mid 2024 and will give building owners the ability to successfully meet state and local regulations with 100% renewable, carbon-free thermal energy. Boston and Cambridge will soon be the first two American cities to offer renewable thermal energy through a district energy system and the Charles River will be soon become a renewable energy source. **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.**

**CHS Framework Recommendations**

Setting the Standard

At the Technical Session held on December 7th, MassDEP introduced "Setting the Standard," a statewide requirement encompassing two key elements: annual reduction of greenhouse gas emissions from buildings and the advancement toward complete electrification of buildings. Vicinity is well-positioned to assist the Commonwealth in attaining these objectives.

Undoubtedly, tackling the climate emergency is of utmost importance and the CHS is an additional regulation that will accelerate decarbonization in the Commonwealth. 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 GHG emissions in 2020. In Boston and Cambridge, the two cities that we are proud to serve, that percentage more than doubles as 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, among the most efficient and cost-effective ways to condition these buildings without compromising reliability remains the production of thermal energy with progressively lower carbon content at a central plant that is supplied to end use customers through an extensive district energy distribution network.

**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. As proven in Europe, district energy systems can be electrified to quickly and efficiently decarbonize the heating and cooling profile of all connected buildings and should be considered a pivotal means to quickly decarbonize dense urban environments. Our product, eSteam™, should be eligible for credits in the emissions reduction standard that MassDEP presented at the CHS session.**

Credit Generation

**Vicinity strongly advises MassDEP to recognize industrial scale heat pumps and electric boilers as technologies eligible for crediting. As mentioned, these technologies will allow us to significantly reduce emissions in the Commonwealth and should be included to generate clean heat credits. In line with the CHS goal of reducing climate pollution and transitioning away from fossil fuels, Vicinity supports maintaining a 'technology-neutral' approach. This approach would enable all emission-reducing actions to qualify for generating credits for clean heat.**

It was noted during the session that eligible biofuels would be credited according to the quantity of emissions they help avoid. Vicinity presently uses a biogenic fuel, LR100, sourced from waste vegetable oil and fats discarded by the food industry. Vicinity asks MassDEP to include LR100 as eligible to receive clean heat credits through the emissions reduction standard.

Although there will be a program review in 2028, to evaluate eligibility to the program, Vicinity does not believe MassDEP should wait until then to consider including district energy systems in the CHS program.

**Conclusion**
Vicinity is firmly committed to fostering a Clean Energy Future. Drawing on 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. In line with this commitment, we wholeheartedly endorse the Commonwealth's initiatives aimed at achieving greenhouse gas emissions reduction goals as outlined in the Clean Heat Standard. We take pride in being at the forefront of innovative approaches and techniques that align seamlessly with the objectives of this standard.

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 her staff.

Thank you,

| | |
|---|---|
| Kevin Hagerty | Matthew O'Malley |
| President, Deputy CEO | Chief Sustainability Officer |

**Vicinity Energy Inc.**
vicinityenergy.us

# WEST BOYLSTON MUNICIPAL LIGHTING PLANT

4 Crescent Street, West Boylston, Massachusetts 01583 Telephone
(508) 835-3681 Fax (508) 835-2952


December 21, 2023 (via email)

Massachusetts Department of Environmental Protection
One Winter Street
Boston, MA 02108

Subject: Clean Heat Standard

Dear MassDEP,

Thank you for the opportunity to submit comments related to the proposed Clean Heat Standard (CHS) regulations. The West Boylston Municipal Lighting Plant (WBMLP) is committed to the Commonwealth's greenhouse gas emission (GHG) reduction goals and will reduce GHG emissions to net-zero by 2050. WBMLP is already preparing its service territory and electrical distribution system for the electrification of the building and transportation sectors.

- The imposition of a CHS obligation on municipal light plants (MLPs) is not supported by the plain language of the Global Warning Solutions Act (GWSA). The Massachusetts Department of Environmental Protection (MassDEP) does not have the legislative authority to regulate MLPs as the GWSA does not specifically authorize a CHS on MLPs. The GWSA only imposes a reporting requirement on MLP's.

- The GWSA legally requires the Secretary of EEA to "evaluate the total potential costs and economic and noneconomic benefits of various reduction measures". The exclusion of MLPs from any cost impact studies supports our position MLPs are not included in the CHS. WBMLP requests EEA, as required by law, to prepare a cost impact study for our ratepayers.

- The CHS framework documents point to other regulations such as the RPS, CES, and CES-E that do not include MLPs because there is no legislative authority to include MLPs in these programs. However, MLPs are legally mandated through the Greenhouse Gas Emission Standard (GGES) to achieve a clean and renewable energy supply that reaches 50% in 2030, 75% by 2040 and Net-Zero emissions by 2050. WBMLP is ahead of schedule and plans to achieve at least an 80% clean and renewable energy supply by 2030.

- The Inflation Reduction Act (IRA) was passed in 2022 and the High-Efficiency Electric Home Rebates (HEEHR) are not available yet. HEEHR rebates will be used to electrify low income and moderate-income homes. These rebates should be deployed first before a CHS is considered. The combination of HEEHR rebates, Mass-Save electrification rebates, and MLP electrification rebates will increase the adoption of heat-pump technology in our service territory.

- MassCEC reports the average installation cost for a whole-home air source heat pump system completed in 2022 through Mass-Save was $22,000.00. Please use accurate average installation costs in all economic analysis and ratepayer cost impact studies.

- The proposed CHS should only regulate the delivered fuels to the building sector (i.e. natural gas, oil, and propane). The entire electricity sector, including MLPs, is already regulated and meeting our GHG emission reductions goals. Including the electricity sector in the CHP increases the cost impact on electric ratepayers.

- The electricity sector is already responsible for expanding and upgrading our distribution systems and transmission interconnections to accommodate the 2-3 times load growth we'll experience as the building and transportation sectors completely electrify by 2050. This significant increase in the cost of service will be passed on to all ratepayers in the form of higher electricity rates as electrification progresses. The electricity sector shouldn't absorb the cost of electrifying the building sector through a CHS. Our electricity rates need to be affordable to consumers as the other sectors electrify.

- The CHS framework requires electric utilities to use annual kWh sales to determine the annual number of residential electrification projects. Residential kWh sales should be used if CHS electrification projects only apply to residential properties. Commercial and industrial customer kWh sales shouldn't be included in the annual CHS compliance requirements for residential electrification projects. If commercial and industrial kWhs are included, their respective electricity rates will be increased to reflect the additional cost of service.

- WBMLPs electricity rates are lower than most other electricity rates in the Commonwealth. As long as our rates remain low, our customers will save money and reduce GHG emissions by electrifying their heating and cooling systems. WBMLPs cost per BTU is less than any of the delivered fuels, which at least provides consumers an economic incentive to electrify. A CHP will increase electricity rates and therefore reduce the economic incentive to electrify.

- Why wasn't a simple, less costly to administer, carbon pricing methodology on delivered fuels considered? What is the estimated administrative cost of imposing a CHS on all impact entities and the regulating agencies?

On behalf of WBMLP's ratepayers please consider our concerns and comments regarding the proposed CHS regulations.

Sincerely,

General Manager

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413-572-0100 | wgeld.org | whipcityfiber.com

WG+E
WESTFIELD GAS + ELECTRIC
whip city fiber

December 21, 2023

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

Submitted via email: climate.strategies@mass.gov

Re: Comments on the Development of a Clean Heat Standard Program and the Draft Program Framework

**COMMENTS OF WESTFIELD GAS AND ELECTRIC LIGHT DEPARTMENT**

Westfield Gas and Electric Light Department (WG+E) is pleased to respond to the request for input into the Development of a Clean Heat Standard (CHS) program and the CHS program framework draft. WG+E serves over 18,000 electric customers and 10,000 natural gas customers in Westfield, MA in Hampden County. We appreciate of the Department of Environmental Protection's (DEP) concern for the wellbeing of the Commonwealth's citizens and approach to Clean Heat to address quality of life. However, we would like to bring some key points to your attention as you review the draft CHS framework. WG+E endorses the need for clean energy, and we support a final structure for a program which incorporates the realities of the current energy landscape.

WG+E supports clean energy like everyone else doing this important work in the Commonwealth. We self-imposed a moratorium on natural gas expansion in the City of Westfield to limit the use of natural gas, although we have adequate capacity to feed continued expansion. Further, WG+E has nearly doubled our ratepayers' contributions to our Energy Conservation Fund to $1.5 million per year. This fund is dedicated to promoting energy efficiency and clean heat projects for both residential and commercial customers. Our recently expanded air-source heat pump incentive program offers up to $4,500 (previously up to $2,500) for residential customers for full-home conversions. This includes a $500 bonus incentive for customers switching from oil or propane heat to the air source heat pump. Additionally, we offer a $5,000 rebate for ground-source heat pumps.

WG+E ratepayers contribute $2.1 million annually to a Green Energy Fund which is dedicated to promoting renewable generation and carbon-reducing projects within Westfield. The Energy Conservation Fund, Green Energy Fund, and heat pump incentives are all actions the WG+E has taken independently from state legislation to prepare both our utility and ratepayers for Net Zero targets and to promote environmental sustainability.

**The Electrification-Only Solution Is Not Attainable**

We all agree that there is a need to reduce building emissions "to deploy electrification at the scale and pace required to meet the Commonwealth's GHG emission reduction goals by 2050."[1] State, federal, and global goals revolve around reducing GHG emissions for the health of the planet and the people

[1] Clean Energy and Climate Plan for 2050 (mass.gov)

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WG+E
WESTFIELD GAS + ELECTRIC
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within it. However, WG+E believes that truly equitable and timely deep decarbonization can only be achieved through a wholistic approach rather than electrification-only.

For example, Colorado recognizes "a mix of supply-side resources which replace traditional gas and demand-side resources which reduce the gas customers use" and includes energy efficiency programs, recovered methane, green hydrogen, and beneficial electrification.[2] Germany is expanding "new hydrogen-ready gas-fired power plants" to stabilize supply without "losing sight of the goal of decarbonization."[3] Even California, in 2022, "agreed to put aside hundreds of millions of dollars to buy power from fossil fuel plants that are scheduled to shut down… Backers say it's necessary to avoid the rolling blackouts like the state experienced during a heat wave in 2020."[4] These three governmental entities, known for their progressive stances on environmental sustainability, each now recognize the need for a diverse fuel mix, yet target a net zero solution.

An electrification-only approach can lead to more emissions and inefficiencies of electric technology versus direct-use gas technology. According to the EIA, "In 2019, U.S. utility-scale generation facilities consumed *38 quadrillion British thermal units (quads) of energy to provide 14 quads of electricity*. Most of the difference between these values was lost as an inherent result of the energy conversion process… Electricity is a secondary energy source that is produced when primary energy sources (for example, natural gas, coal, wind) are converted into electric power. *When energy is transformed from one form to another and moved from one place to another, some of the input energy is lost in the process* [emphasis added]."[5]

Electric appliances may consume less on-site energy than their natural gas counterparts, but this is more than offset by the greater energy efficiency of the overall natural gas production and delivery. According to the American Gas Association,[6] a natural gas home requires a quarter less total energy on a full fuel-cycle basis than is required for a comparable all-electric home. Less than 10% of natural gas produced is used or lost from the point of production to the residence. In contrast, almost 70% of energy produced to satisfy electric needs of consumers is used or lost in the process of energy production, conversion, transmission, and distribution.

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[2] Learn About Clean Heat Plans | Public Utilities Commission (colorado.gov)
[3] Germany to build 17-21GW of new hydrogen-ready gas-fired power plants, says Chancellor | Hydrogen news and intelligence (hydrogeninsight.com)
[4] California scorns fossil fuel but can't keep the lights on without it - POLITICO
[5] "More than 60% of energy used for electricity generation is lost in conversion", U.S. Energy Information Administration (EIA)
[6] Appliance Cost and Emissions Comparison 2022 (aga.org)

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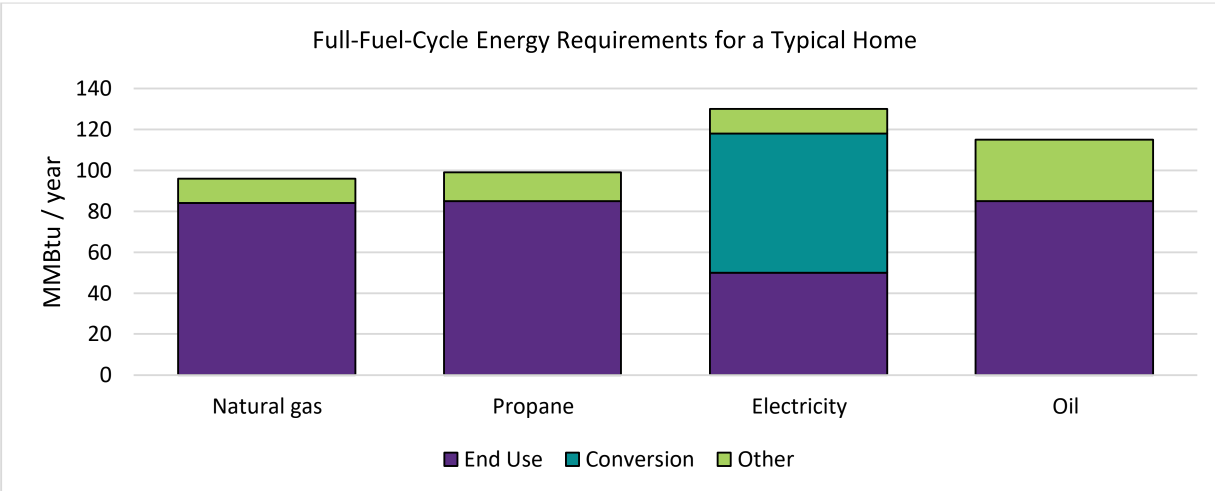
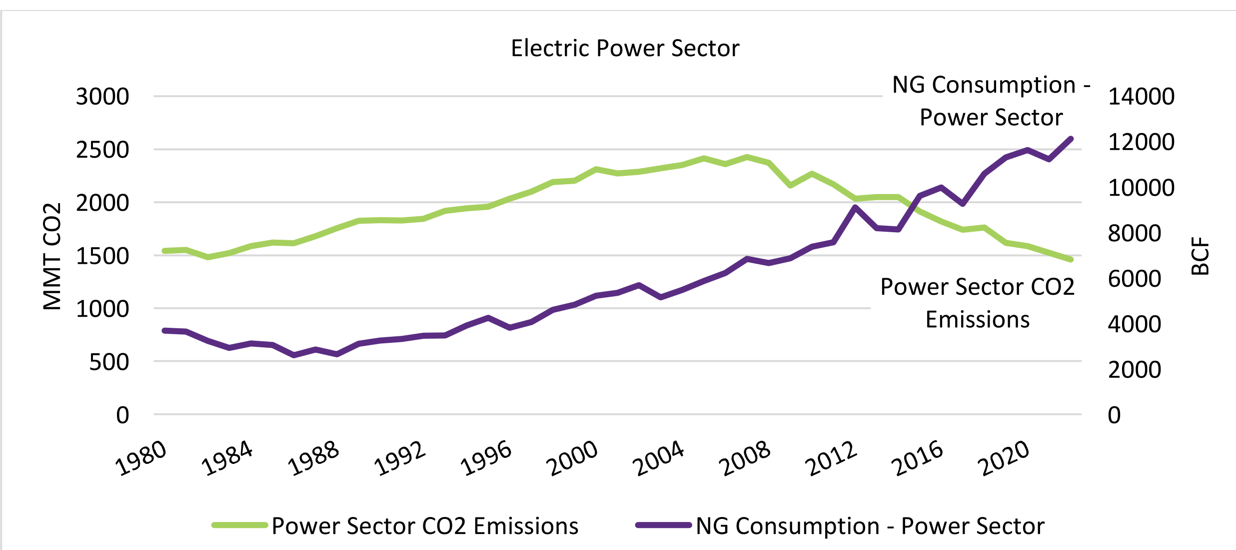



*Note: "Other" includes impacts from distribution, transportation, processing, and extraction.*
*Source: American Gas Association, "Comparison of Home Appliance Energy Use, Operating Costs, and Carbon Dioxide Emissions 2022 Update", March 2023.*

The emissions from natural gas use in power generation has led to a decrease in emissions from the power sector when compared to other fossil fuels. We understand that natural gas is not considered "green" or "clean," yet it has greatly helped reduce pollution in the Commonwealth and made the power system cleaner than ever before. Natural gas has been the key driver of a cleaner, cost effective, and more efficient power fleet in the region, and has displaced traditional baseload coal and oil-fired plants. New England has seen a 31% reduction in statewide gross emissions from 1990 to 2020[7] while increasing the use of natural gas in the region.




*Source: Total Energy Reports - U.S. Energy Information Administration (EIA)*
*Monthly Energy Review Table 4.3 Natural Gas Consumption by Sector*
*Monthly Energy Review Table 11.6 Carbon Dioxide Emissions From Energy Consumption: Electric Power Sector*

[7] Massachusetts Clean Energy and Climate Metrics | Mass.gov

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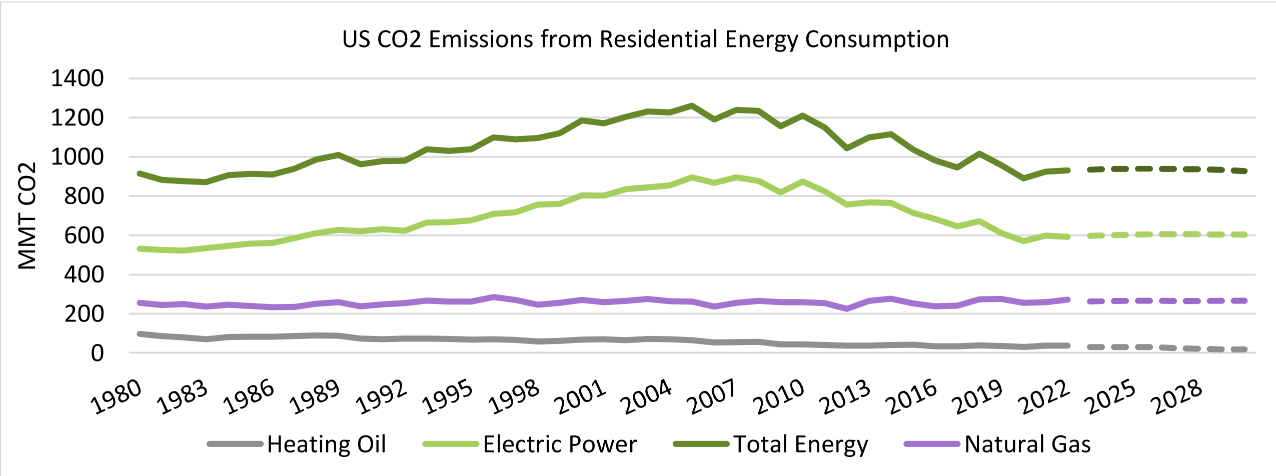


*Source: Total Energy Reports - U.S. Energy Information Administration (EIA)*
*Table 11.2 Carbon Dioxide Emissions from Energy Consumption: Residential Sector*

Sixty-two percent of our residential customers use natural gas for heat. WG+E believes it is important to understand the full fuel cycle of electric technologies in comparison to direct-use natural gas technologies. Although we are promoting clean air source heat pumps, we recognize that natural gas still has a valuable role in the energy and heating industry. We advise retaining natural gas as an important, affordable, and reliable energy source.

**CHS Conflicts with Other Programs and Regulatory Boundaries**

With the goal of CHS to reduce greenhouse gases, WG+E feels very strongly that this program must build upon other GHG reduction efforts and not duplicate, or conflict, with other federal, state, or local programs that are already established or in the pilot stage. Mass Save, the 10-municipality pilot program to prohibit fossil fuel in new construction, supporting carbon-free electric energy supply options, and municipally adopted special energy codes, are all programs that reduce carbon emissions in the building sector. As a result, greenhouse gas emissions are being reduced without imposing further regulations onto the citizens of the Commonwealth. With regards to some of these programs, the Massachusetts Legislature desires to collect actual data pertaining to emission reduction, cost, and impacts on housing and commercial building production to determine their effectiveness. We implore the MassDEP to not interfere with these existing programs with its rulemaking.

Furthermore, municipal light plants' (MLP) operation and assets are regulated pursuant to M.G.L. Chapter 164 et seq. The jurisdiction of MassDEP over MLPs is tenuous at best; the potential imposition of penalties for the failure of an MLP's customers to convert to electric heat is an ultra vires application of MassDEP's authority.

**State Goals Should be Technology Agnostic**

As a utility, WG+E recognizes the limitations of the current infrastructure to support full electrification. From a long-term perspective, an electric-only clean heat solution is not sustainable at the current pace of progress. The inability to build transmission due to environmental advocates' legal challenges and supply chain concerns has been a theme in the current news landscape and felt directly as a local utility. In New England, there is a lack of additional electrical generation coming online from reliable baseload units like nuclear or gas-fired generation.

WG+E is making significant investments in our electric and natural gas distribution systems while also implementing the clean energy programs, and we are not alone in these endeavors. It is important to continue to maintain our safe and reliable natural gas distribution network, and we expect to utilize this existing infrastructure for future renewable natural gas and hydrogen fuels. Because of the existing infrastructure and solutions already being explored by various entities, WG+E recommends letting the market identify the best solutions to effectively reduce GHG. Although we appreciate the endeavor, the DEP as a regulatory body is not as effective as a free market to effectively force the changes proposed in the draft CHS framework.

To put the imposed cost of forced electrification into perspective, WG+E performed a high-level analysis to fully electrify our city in 2021. At that time, before inflation skyrocketed and excessive supply chain issues materialized, we estimated full city electrification would be $444 million. This analysis only encompassed the cost of increasing the distribution system and related equipment, distribution transformers, upgrading current substations, and adding additional substations. This estimate did not account for additional power supply costs, incentives to customers, or consumer expenses.

Other technologies exist for clean heat, and we encourage consideration of hydrogen and renewable natural gas fuels as part of the solution. The Clean Energy and Climate Plan for 2025 and 2030 (CECP) states that the "fundamental purpose of the Clean Heat Standard is to reduce emissions, not to promote certain technologies for extrinsic reasons."[8] WG+E advocates for its ratepayers and is concerned with limiting the heating options available to the citizens of Westfield. We do not support the CHS electrification framework accepting electrification as the only viable pathway to decarbonization.

**Electric-Only Heat Harms the Most Vulnerable**

The high electricity rates in Massachusetts already pose a considerable economic burden on both residents and businesses. Massachusetts and New England have some of the highest electric rates in the country.[9] This CHS's sole focus on electric technologies for clean heat poses a disproportionate impact to residential customers, especially those in Environmental Justice Communities (EJCs). These high electric prices in Massachusetts raise concerns about the affordability of electrification. Increasingly exorbitant electricity prices driven by electrification, among other additional costs of operating businesses here, will add to the further migration of commercial and industrial (C&I) entities out of the Commonwealth.

[8] Appendices to the Massachusetts Clean Energy and Climate Plan for 2025 and 2030
[9] *U.S Energy Information Administration Electric Power Monthly, Table 5.6.A. Average Price of Electricity to Ultimate Customers by End-Use Sector*

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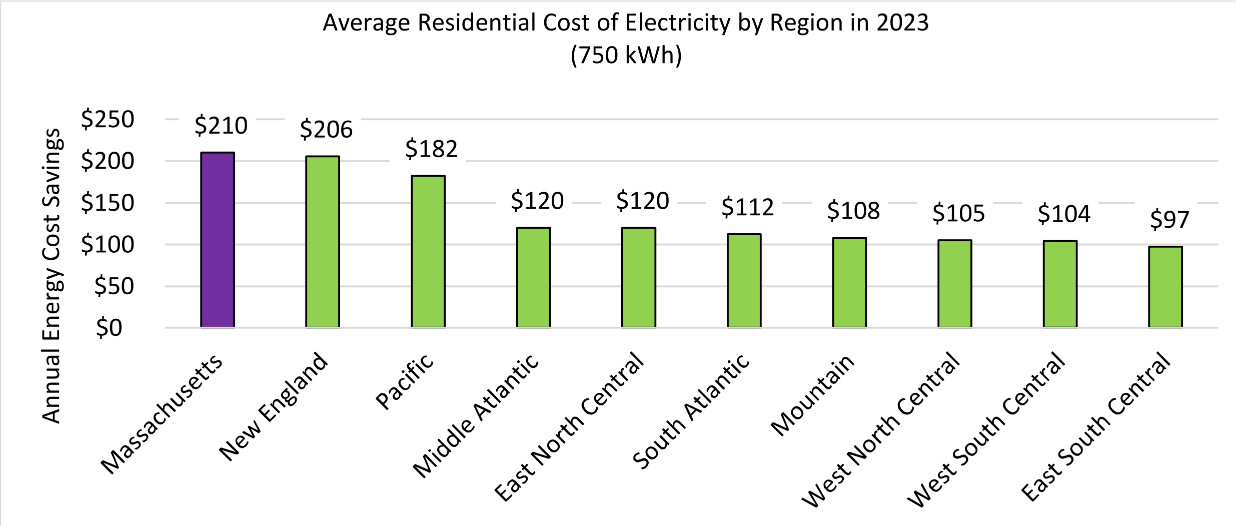


*Source: U.S Energy Information Administration Electric Power Monthly, Table 5.6.A. Average Price of Electricity to Ultimate Customers by End-Use Sector*

WG+E estimates that the energy cost to our customers would surge by 223% with the additional heating and electric vehicle charging load. This is a striking increase when considering that cost could be avoided by not forcing our residential rate base to transition fully from low-cost and efficient natural gas to electricity. This underscores the importance of considering alternative fuels like hydrogen and renewable natural gas as clean heat fuels, which can contribute to decarbonization without imposing the same substantial energy cost burden on our diverse customer base.

Further, the most impacted customers will be those Westfield residents in Environmental Justice Communities including individuals and families that are low and fixed income, minority, elderly, and English Language Learners. These key groups will continue to be the most impacted by the increased energy cost burdens and any increase represents a significant proportion of their low or fixed income. WG+E and the other municipal utilities in Massachusetts have the duty to protect our EJ populations. The CHS will force these groups to transition to higher-cost technologies which will be an added impact to their monthly energy bills. A recent study estimated that an Energy Star-qualifying natural gas furnace energy costs are nearly $400 less than that of a qualifying electric air-source heat pump.[10]

Beyond the recurring monthly energy burden, air-source heat pumps cost more to install. An "average natural gas heating system costs approximately $2,250. By contrast, the average electric heat pump costs between $7,500 and $10,000."[11] The up-front installation cost of electric technology poses another barrier to engagement, one that is especially harmful to vulnerable communities.

[10] American Gas Association, "Empowering Consumer Choices: Analyzing the Impact of ENERGY STAR Program on the Adoption of High-Efficiency Gas Appliances," June 2023.
[11] Why Most Americans Want Natural Gas - American Gas Association (aga.org)

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**Conclusion**

Although WG+E supports the goals of decarbonization, we advise that the Clean Heat Standard framework consider the precedent set by other governmental entities to consider a diverse solution, and not an electrification-only solution for decarbonizing buildings and the economy. Advances in natural gas technology and infrastructure has allowed for reduced emissions. RNG and hydrogen are promising fuel technologies that must be considered as part of the approach to decarbonization. WG+E has a duty to its ratepayers to provide low cost, reliable energy, and we strongly encourage the Clean Heat Standard to consider the long-term consequences of an electrification-only approach on the most vulnerable populations in Westfield and the Commonwealth.

We thank you for your consideration and opportunity to comment on this framework.

Sincerely,

Thomas P. Flaherty, Sr.

Thomas P. Flaherty, Sr.
General Manager

## Parnay, Angela L (DEP)

| | |
|---|---|
| **From:** | Keith Zellman <zeddmann@outlook.com> |
| **Sent:** | Sunday, January 28, 2024 2:05 PM |
| **To:** | Strategies, Climate (DEP); Bruce Tarr; Ann-Margaret.Ferrante@mahouse.gov |
| **Subject:** | Feedback on Switching to Heat Pumps to Meet Massachusetts Proposed Clean Heat Standard |



Greetings-
I received a dire email from my fuel oil company about Massachusetts' proposed Clean Heat Standard.
While it's obvious the fossil fuel industry is using fear tactics to state their case, **I am concerned with the current overselling of Air Source Heat Pumps (ASHP or minisplit) as a sole heat source in cold climates because of our current Massachusetts residential electric rates** (ranked fourth highest in the nation- see links below).

*Here is my recommendation for achieving Clean Heat in Massachusetts:*
**The Clean Heat Standard should focus on lowering Massachusetts electricity rates for "Clean Heat" customers to make the transition from fossil fuels economically rational.**

- Institute lower electric rates for homes that use single source "clean heat" (i.e. no fossil fuel backup heat system) to make it economically viable (see actual experience below)

- The currently proposed Clean Heat Standard requires homeowners to comply indirectly with this needed transition by forcing fossil fuel heat providers to upsell 3% per year of their customers to meet the Clean Heat Standard
    - This is a slow transition that does not address the fundamental resistance of economic viability due to high electricity costs

- A further reduction in fossil fuel heating can be achieved by increasing purchase incentives for Photovoltaic Solar Panels (PV) in combination with Air Source Heat Pumps (ASHP or minisplit)
    - The combination of PV and ASHP results in significant electric usage savings (see actual experience below)
    - Return to higher compensation for PV electricity production via the SMART program
        - The current SMART program pays ~$3 for PV electricity generation of ~ 1 MWatt/month
            - The original SMART program paid ~ 30 times more

*Here is my actual experience that informs my recommendation:*
2 years ago I purchased a 10KW PV (photovoltaic solar panel) system and Mitsubishi HyperHeat ASHP (Heat Pump) in my 15 year old, 2K sq ft home in Gloucester.

- I chose to keep my hydronic oil heat as a backup system despite the ASHP marketing that encouraged using ASHP as the single heat source (Mitsubishi Hyperheat ASHP delivers heat at -13 degrees)
- I purchased the Mitsubish Kumo Station to automatically switch over from ASHP to hydronic heat by fuel oil at a specified outside temperature
- I purchased a branch circuit power monitor called IotaWatt to quantify electricity usage of my ASHP and oil furnace

I initially had my backup heat (oil furnace) switchover temperature set to 17 degrees because of the ASHP loss of efficiency at lower outside temperatures

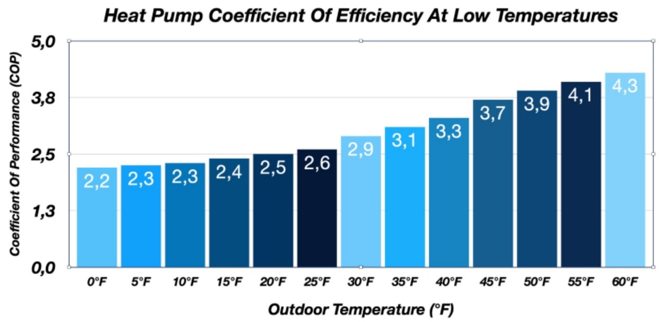
- COP (an efficiency rating that measures energy in vs energy out)
    - 17 degrees  COP of 2.7
    - 47 degrees COP of 4.0
- These COP values show the ASHP efficiency drops ~ 33% at those two outside temperatures

Using my Iotawatt branch circuit power monitor, I observed **when the outside temperature is less than 35 degrees, the electricity consumption of my ASHP nearly doubles**

- This actual increase in electricity consumption is an efficiency drop of ~ 50%
    - COP efficiency ratings are calculated using controlled conditions
- There is a dearth of theory of operation information for the Mitsubishi ASHP
    - There are several auxiliary resistive heaters that are used in the Mitsubishi Hyperheat systems:
        - 70 watt 50% duty cycle heater at the piston head to keep the refrigerant from migrating to the coldest part of the fluidics (the piston) when the system is not operating- this migration causes the refrigerant to leak
        - a pan heater for defrosting condensation
        - auxiliary air heater to overcome the physical limitation of extracting heat from air less than 40 degrees (auxiliary heater is required for all “cold climate” ASHP)

- What this doubling of electricity usage meant for me was a $900 credit in November 2022 (from summer PV production- including cooling my house with ASHP) became a $200 electric bill in January
    - i.e. **it cost $550/month for December and January to heat with ASHP compared to $250/month to heat with $4/gallon oil**
- How do I know these costs?
    - My Iotawatt power monitor data and the current Massachusetts electricity and fuel oil rates
- Did ASHP heat my house with average outside temperatures of 27 degrees in those months (per National Weather Service data for Beverly MA)?
    - Yes
- Was ASHP heat a cost-effective way to heat my house?
    - No, due to:
        - Massachusetts has the fourth highest residential electric rate in the country
            - https://www.statista.com/statistics/630090/states-with-the-average-electricity-price-for-the-residential-sector-in-the-us/
            - https://www.chooseenergy.com/electricity-rates-by-state/#0-section-copy
            - https://www.electricchoice.com/electricity-prices-by-state/

        - Cold Climate ASHP heating efficiency drops with temperature
            - https://learnmetrics.com/heat-pump-efficiency-vs-temperature-graph/




As we can see from the heat pump temperature efficiency chart, we are seeing very high COP 4 efficiency at higher temperatures (above 52°F. At below 32°F, we see the heat pump efficiency falling below COP 3 (300% efficiency).

At single-digit temperatures, the efficiency of heat pumps drops by almost half compared to 47°F temperature (HSPF rating, for example, is measured at 47°F). This doesn't mean that heat pumps stop working at freezing temperatures; it just means they are less efficient and thus produce lower heating output than the one we have on the label.

*Note:* These are low-temperature heat pumps. The COP value of standard heat pumps will fall much quicker (with a COP rating of about 1.5 at 10°F).

- ASHP manufacturers overcome this limiting physical property by using electricity to heat the air required for the ASHP

**<u>The efficiency limitations of ASHP cannot be changed except by using additional electricity when outside temperatures are less than ~ 40 degrees.</u>**

**<u>Since Massachusetts has a regulated electricity market, we can control the cost of electricity.</u>**

**<u>Incentive that cost for the outcome we all need to mitigate climate change.</u>**

Best,
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