

A Comparison of Clean Heat Standards:

Current Progress and Key Elements

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1. Executive Summary

Existing policies to reduce emissions associated with heating buildings and completing various manufacturing and industrial processes, such as building codes and demand side management programs, are critical to cost-effectively addressing climate policy goals. However, these policies are not resulting in emissions declining at the pace or scale needed to meet either short-term or long-term emissions reductions requirements. Other, more comprehensive policies are needed. The concept of a Clean Heat Standard (CHS) to reduce the thermal sector's greenhouse gas emissions is gaining traction in multiple jurisdictions. At least ten states in the United States are considering the policy, with Colorado and Vermont having enacted legislation and Massachusetts and Maryland considering CHS regulation.

A CHS is a performance standard that requires thermal fossil fuel suppliers to deliver a steadily increasing percentage of low-emission heating services to customers. Its compliance is demonstrated through a "bottom up" tallying of estimated emission reductions from various individual clean heat measures. CHS structures can vary in the range of clean heat measures that are eligible, as well as the extent to which clean heat activities can be generated by different market actors and then traded and/or sold. Of the four states whose CHS policies are highlighted in this paper, Colorado does not allow credit trading while Vermont does. Massachusetts and Maryland are also considering credit trading CHS structures.

If designed well, a CHS can provide:

- A consistent and clear market signal to prioritize lower emission heating options
- Flexibility for gas utilities and other fossil fuel companies to deliver emission reductions at lowest cost
- Customer choice
- Incentives to non-utility businesses to promote clean heat measures, grow and innovate
- An overarching umbrella policy structure under which complementary policies can support emission reductions while addressing other policy objectives.

The success of and familiarity with other performance standards, such as energy efficiency resources (EERS) and renewable portfolio standards (RPS), offers promise that a CHS – if designed carefully and well – may finally break through the distinct challenge in reducing thermal sector emissions. All CHS policies currently under design and discussion are in an early stage of development. Nevertheless, as this paper identifies, there are already opportunities to learn from the current efforts underway, particularly from Colorado and Vermont.

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Table 1 provides a summary of recommendations for the ideal design of a CHS, each of which is discussed in some detail in later sections. A CHS policy that deviates from some of these recommendations can still be effective for advancing climate policy objectives, depending on the mix of energy suppliers, current patterns of energy consumption, administrative capacity for addressing policy complexity, and other conditions in a given jurisdiction, as well as the specifics of how alternative policy choices are crafted.

Table 1. Summary of ideal CHS design elements and recommendations

Design Element	Recommendations
CHS Scope	<ul style="list-style-type: none"> Apply to all thermal sectors: residential, commercial, and industrial. Apply to all conventional fossil fuels: fossil gas, fuel oil, propane and other delivered fuels.
CHS Obligation Size	<ul style="list-style-type: none"> Align with thermal emissions reductions needed to comply with climate mandates. Increase over time. Include regulatory authority to set and revisit requirements to ensure state emission reduction goals are achieved. Be designed as an over-arching, umbrella policy, with the number of clean heat credits required to equal the state’s total emission reduction goals and with reductions produced through other current or future complementary policies nested under the CHS (therefore creditable and counting towards the CHS).
Obligated Parties	<ul style="list-style-type: none"> Include all entities selling gas: regulated and unregulated entities as well as investor-owned, municipal and competitive gas suppliers. Include those entities selling “delivered fuels.” Determining the obligated party (wholesaler or retailer) may require legal and market research and may vary by state. Not include electricity providers, at least in the initial policy design. Not include energy extraction companies.
Obligation measurement	<ul style="list-style-type: none"> Measured in CO₂e. Measured at the site level (“burner tip”), except for biofuels, whose emission reduction values should be calculated based on full lifecycle emission reductions that they produce.

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<p>Eligible Measures/Activities</p>	<ul style="list-style-type: none"> • Weatherization and other building improvements • Heat pumps and heat pump water heaters • Solar thermal • Zero carbon district heating • Low carbon district heating (within guardrails) • Advanced wood heating (within guardrails) • Certain biofuels, including biomethane or RNG, within guardrails like: <ul style="list-style-type: none"> ○ Requiring a lifecycle accounting of GHG emissions ○ Requiring a contractual pathway for delivery of RNG ○ Limiting credit eligibility to only existing RNG sources ○ Precluding RNG/biofuels from receiving CHS credits if they are shown to create other environmental and/or social harms ○ Possibly establishing maximum lifecycle carbon intensity scores for biofuels and/or capping the percentage of credits from RNG/biofuels. • Green hydrogen (within guardrails).
<p>Credit-specific design elements</p>	
<p>Obligated Parties Should be Able to Acquire Credits by</p>	<ul style="list-style-type: none"> • Self-generating credits • Contracting with others to generate credits • Utilizing a third-party energy program administrator to oversee and deliver clean heat credits • Purchasing credits on an open market (depends on jurisdiction) • Assigning their obligation to a “default delivery agent” (depends on jurisdiction).
<p>Setting Credit Values</p>	<ul style="list-style-type: none"> • A Technical Advisory Group (TAG) should be established to develop credit values • Credits should be “time-stamped” • TAG assumptions should be updated annually • Assumptions should be “locked” for the given year, and cannot be changed retroactively • The deemed savings for infrequent and specialized projects (e.g. for commercial/industrial processes) should be developed via a customized process.

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Borrowing / Banking Credits	<ul style="list-style-type: none"> Banking allowed up to a maximum percentage of credits (e.g., 15 – 30% per year); cumulative emission reduction goals must still be met. Borrowing of credits should not be allowed.
Cost Containment Mechanisms	<ul style="list-style-type: none"> An Alternative Compliance Payment or Mechanism (ACP/ACM) or cost cap should not be included in a CHS. If it is, it should be set at a high enough level that obligated parties find it less expensive to invest in clean heat measures than pay the ACP. If it is, then ACP generated funds should be used to support low- and moderate-income (LMI) measures.
Ensuring Compliance	
Evaluation, Verification & Measurement	<ul style="list-style-type: none"> An entity should be identified to annually assess and report on compliance, and provide an informal opportunity for parties to resolve and discuss compliance related issues. There should be regular evaluation, verification and measurement (EM&V) processes. Findings from EM&V studies should inform modifications to the CHS and ensure emissions reductions are being achieved.
Non-compliance Penalty	<ul style="list-style-type: none"> Non-compliance penalties should be incorporated. Non-compliance penalties should be significantly more expensive than the cost to acquire credits. Funds received from non-compliance penalties should be used to support CHS delivery to LMI customers. Consideration should be given to setting a non-compliance penalty payment specific to non-compliance with the LMI carve out (see below). Obligated parties that are regulated (i.e., gas distribution utilities) should be prohibited from passing the cost of non-compliance penalties onto their customers.
Default Delivery Agent (DDA)	<ul style="list-style-type: none"> Determination of the need for a DDA should be made depending on the characteristics of the specific CHS jurisdiction. If a DDA might be needed, it is better to incorporate a DDA at the start of the CHS program design, rather than after the CHS has been implemented.

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	<ul style="list-style-type: none"> • If mechanisms such as a non-compliance penalty or ACP are incorporated into a CHS, a DDA can be a useful entity to circulate any revenue back to customers (in particular, LMI). • If a DDA is created, it can be used to act effectively as a clearinghouse and jurisdiction-wide resource.
<p>Designing for Equity</p>	<ul style="list-style-type: none"> • The CHS should be designed – from beginning to end – with equity at the forefront of considerations. • A LMI carve out should be created whereby a minimum percentage of credits must come from clean heat measures provided to LMI customers. • To increase the customer value of the carve out, require that the clean heat measures (or resources) be “long-lived” measures (e.g., weatherization and heat pumps rather than biofuels). • Consider placing a fee on non-LMI measures to create a revenue source to support LMI measures and programs. <ul style="list-style-type: none"> ○ If there is an ACP (described earlier - and not recommended), reserve payments to support LMI measures and programs. • Ensure coordination and alignment between the CHS design and existing LMI-focused energy programs and services. • Pursue other complementary policies to minimize low-income energy burdens, including increased investment in bill payment assistance programs, low-income rates and rental efficiency standards (see Sections 4.9 and 5.2) • Involve representatives of disadvantaged communities in all stages of CHS design.
<p>Integration/Coordination with Other Policies</p>	
<p>Strategically Decommissioning the Gas System</p>	<ul style="list-style-type: none"> • Require a "future of gas" proceeding in which the state, through an independently hired contractor and a stakeholder process, analyzes decarbonization pathways - and periodically (e.g., every 5 years) redo the study based on updated information • Require gas utilities to file near-term (5-year) and longer-term (20-year) plans for how they will decarbonize, consistent with the results of the future of gas study results • Require gas utilities to simultaneously file with PUCs distribution system plans that identify all system needs

	<ul style="list-style-type: none"> • Require that gas utilities’ distribution system plans routinely consider non-pipe alternatives to capital investments, specifically including consideration of options for “pruning” their systems • Eliminate any existing subsidies or allowances for new gas connections • Consider accelerated depreciation of any new assets and potentially for existing assets (recognizing that this will increase rates in the short-term but reduce the risk of stranded assets in the long-term).
Equitable Rate Design that Supports Decarbonization	<ul style="list-style-type: none"> • CHS statute can call out the need for stakeholders, at some future point in time, to open a proceeding to address rate design from a holistic, comprehensive approach that considers the balancing act underway as thermal energy consumption shifts from gas (and reduced consumption so fewer bill payers) to electricity (with increased consumption and more bill payers).
Ensuring Efficient Equipment Installations & Ongoing Electric Sector Decarbonization	<ul style="list-style-type: none"> • Policies that drive investment in efficiency, renewables and storage are critical to ensure that a CHS is implemented in a fashion that reduces as many emissions as cost-effectively as possible. • Coordination across policies should be purposely addressed and required to ensure efficient and coordinated use of energy, labor and financial resources.
Workforce Needs & Opportunities	<ul style="list-style-type: none"> • Recognize that workforce challenges are real and will take time to address. • Ensure that there are other policies in place – and entities capable of implementing said policies – to (a) develop and implement a workforce development plan; (b) coordinate implementation across multiple market actors; and (c) track performance and modify plan and approach, if needed.

2. Introduction

As more states consider the potential role of a CHS, practitioners and stakeholders can begin to see how different jurisdictions choose to structure and implement the standard, and compare various policy approaches and program design details.

First, however, they must understand the multiple program design elements of a CHS. Thus, this paper is organized as follows:

Section 3 describes the challenges associated with reducing thermal emissions from buildings and industry, summarizes what a CHS is, including its potential advantages and disadvantages and reviews the current landscape of CHS policies. The four jurisdictions covered include Colorado, Vermont, Massachusetts and Maryland. Note that these jurisdictions are in different stages of CHS development, and all are still being modified, with significant opportunity for stakeholder input.

Section 4 provides a detailed review of nine key policy elements. The authors' recommended approach is outlined via a question-and-answer format. Each key policy element closes with a section, "Field Applications," reflecting the authors' understanding of whether/how policy makers in Colorado, Vermont, Massachusetts and Maryland are currently approaching the respective policy element.

Section 5 addresses other policy areas that should be addressed, when considering the role and design of a CHS. These include gas system decommissioning, equitable rate design, ensuring ongoing decarbonization of the electric sector and workforce needs. These policy areas are critical to ensuring the goal of a CHS – to reduce emissions from fossil fuel consumption in the thermal sector – is successfully achieved. However, they are not necessarily design elements of a CHS, per se.

To develop this paper, the authors researched available existing literature regarding CHS and other performance standards and reviewed available bills, laws, regulations and hearing submissions. The authors also interviewed several individuals involved in designing, developing and implementing CHS in Colorado, Maryland, Massachusetts and Vermont. The authors thank these individuals – who represented various government agencies, non-profits and other entities – for their time, thoughtfulness and candidness.

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3. Thermal Emissions, Clean Heat Standards and Status Update

3.1 The Scale of Thermal Sector Emissions

A CHS is intended to reduce greenhouse gas (GHG) emissions from the “thermal sector” of the economy – or energy used for space heating, water heating, industrial processes and other end uses in the residential, commercial, and industrial sectors. Nationally, the thermal sector accounts for nearly one-third of all carbon dioxide (CO₂) emissions from energy use, which is about the same as the electric sector and slightly less than the transportation sector.¹

The importance of thermal sector emissions varies considerably from state to state, from a low of about 9% of total energy-related GHG emissions in Florida and Hawaii to over 50% of energy-related GHG emissions in Alaska, the District of Columbia and Louisiana. Thermal sector emissions typically represent a larger portion of total energy-related GHG emissions in northern U.S. states, because of the greater need for energy for space heating, and/or in states with a lot of heavy industry. With respect to the states whose CHS policies are discussed in this report, thermal sector emissions account for 26% of energy related GHG emissions in Maryland, 30% in Colorado, 41% in Massachusetts and 48% in Vermont.^{2,3}

3.2 The Challenge of Reducing Thermal Emissions from Buildings and Industry

Many jurisdictions have established climate-related goals and mandates. To achieve these goals, a variety of energy policies have been developed and implemented. These include carbon taxes, cap-and-trade or cap-and-invest programs, electric renewable portfolio standards (RPS), electric and gas utility energy efficiency programs, equipment efficiency standards, building

¹ U.S. Energy Information Administration, Energy-Related CO₂ Emission Data Tables, Table 3. 2021 State energy-related carbon dioxide emissions by sector, <https://www.eia.gov/environment/emissions/state/>.

² Ibid.

³ The relative importance of the residential, commercial and industrial portions of thermal sector emissions also varies considerably by state. Nationally, residential and commercial buildings account for 12% of energy-related CO₂ emissions with the industrial sector accounting for another 20%. In Colorado, residential and commercial building emissions are about the same as industrial emissions (each accounting for about 15% of total energy-related emissions). Emissions from residential and commercial buildings are substantially greater than industrial emissions in Vermont (with 41% energy-related CO₂ emissions coming from residential and commercial buildings vs. 7% from industrial facilities), Massachusetts (with 36% energy-related CO₂ emissions coming from residential and commercial buildings vs. 6% from industrial facilities), and Maryland (with 21% energy-related CO₂ emissions coming from residential and commercial buildings vs. 5% from industrial facilities).

energy codes and low or zero-emission standards for sales of new light and heavy-duty vehicles (e.g., Advanced Clean Cars and Advanced Clean Trucks Standards). For example, at least 30 states have renewable portfolio standards (RPS),⁴ at least 25 states have energy efficiency resource standards (EERS) for electric and/or gas utilities,⁵ three states (California, Washington, and Oregon) along with British Columbia participate in a Low Carbon Fuel Standard focused on the transportation sector⁶, 16 states have adopted Advanced Clean Vehicle standards,⁷ and both British Columbia and the Canadian federal government have adopted carbon taxes.⁸

Some of these policies, such as efficiency performance standards for fossil gas utilities, provide some greenhouse gas emission reductions from buildings and industry. However, climate policies have generally been more heavily focused on the electricity sector and, increasingly in recent years, the transportation sector. With looming climate goals and progress being made in reducing emissions in the electricity sector and transportation, policy makers are beginning to turn to the challenge of reducing emissions from the thermal sector.

Reducing emissions in the thermal sector is uniquely challenging. Each state has hundreds of thousands if not millions of individual customers, each of which typically uses fossil heat for several different end uses (heating, water heating, cooking, drying, industrial processes, etc.). Decarbonizing the thermal sector means influencing or affecting all of those heating systems and related fuel choices. There are also a variety of different entities involved with providing thermal energy services. This includes regulated monopolies as well as wholesale, distribution and retail fuel delivery (and equipment/service) providers. Furthermore, much of the equipment that is associated with thermal use has a long life (e.g., 15-25 years for a furnace or boiler), meaning opportunities for improvement or change are infrequent. Building efficiency upgrades and heating equipment change-overs also typically require significant up-front capital investments that many customers cannot afford; even customers who can afford to change heating systems may be hesitant to do so given both the cost and lack of familiarity with alternatives.

⁴ U.S. Energy Information Administration (<https://www.eia.gov/todayinenergy/detail.php?id=4850>).

⁵ American Council for an Energy Efficient Economy (<https://www.aceee.org/topic/eers>).

⁶ RNG Coalition (<https://www.rngcoalition.com/policies-legislation-1>).

⁷ U.S. Department of Energy (<https://afdc.energy.gov/laws/california-standards>).

⁸ <https://www2.gov.bc.ca/gov/content/environment/climate-change/clean-economy/carbon-tax>.

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In “The Clean Heat Standard,” Richard Cowart of Regulatory Assistance Project (RAP) and Chris Neme of Energy Futures Group (EFG), describe the challenge of reducing emissions from existing buildings:

“The problem of thermal pollution is one that very deeply involves human behavior. It is no small thing to create a public policy that can reach out to just about every building owner...and lead them to make substantial investments in new heating systems to address a global problem. Technology is not the limiting issue. We have the technology to “vaccinate” most buildings...with cold-climate heat pumps, biofuels, and advanced wood heat systems. But we lack the programs to deliver enough units to enough buildings fast enough to meet our climate goals.”⁹

Thus, even though there are some policies in place to address emissions resulting from the thermal sector – including various incentives and tax credits – the results are too slow and too incremental to meet various greenhouse gas (GHG) mandates and goals. In the same paper quoted above, Cowart and Neme explain why other policies to address thermal sector emissions are unlikely to succeed in isolation, and that none would be as “singularly effective” as a clean heat standard (CHS). While their comments below are specific to a Vermont-based CHS, the general concepts hold for other jurisdictions, too:

“Carbon pricing, by itself, is a weak and potentially expensive means to drive change in the buildings sector, where actions must be taken by individual building owners facing significant barriers to change. Cap-and-invest programs can help, but changes in fuel prices alone have not historically driven much change in heating systems.”¹⁰

Thermal energy efficiency programs are essential to delivering equitable and effective heating solutions... But even ambitious weatherization efforts can deliver only about 25% reductions in the heat demands of a typical Vermont home, so up to 75% of the needed fossil reduction has to come from switching to cleaner energy sources.

Building codes and appliance standards can improve the performance of new construction in Vermont, and of replacement water heaters and furnaces. But the pace

⁹ Cowart, R., Neme, C. “The Clean Heat Standard.” An Energy Action Network White Paper. December 2021. P. 9.

¹⁰ *In economic terms, the price-elasticity of demand for heating fuels is quite low. It would likely require an unacceptably high carbon price to drive building owners to install new heating systems, unless the carbon program also provided customer assistance and financial incentives to accelerate change.*

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of new construction, less than 1% per year,¹¹ and the expected percentage improvement in appliance efficiencies are too low and too slow to deliver the reductions we need in fossil heat consumption in coming decades.

Electric utilities - Vermont has succeeded in delivering electric energy efficiency, renewable power, and some fossil fuel avoidance through performance standards imposed on electric utilities, including Tier 3 of the Renewable Energy Standard (RES).¹² However, it makes little sense to impose additional performance obligations on [Vermont's] cleanest major source of energy (electricity) while imposing almost no obligations on the fossil fuel providers that are delivering the most carbon-intensive fuels we consume (fuel oil, propane, natural gas). To deliver the depth of change required, we need to engage the existing fossil industry in its own transition to a clean thermal sector."¹³

3.3 What is a CHS?

A Clean Heat Standard (CHS) is a policy instrument for addressing emissions from the thermal sector that has begun to gain interest in a number of U.S. states and some countries in Europe. We define a CHS as a performance standard that requires thermal fossil fuel suppliers to deliver a steadily increasing percentage of low-emission heating services to customers. That means that there is at least some level of flexibility in terms of which mix of measures is used to meet emission reduction goals. Compliance with a CHS is demonstrated through a “bottom up” tallying of estimated emission reductions from individual measures such as heat pump installations, weatherization jobs, sales of different types of low-GHG fuels, etc.

¹¹ Building energy codes also govern additions and changes to existing buildings. However, such savings are still likely to provide only a modest contribution to the substantial levels of GHG emission reductions required to meet the state's goals. That is because (A) only a small fraction of existing building energy use is affected by codes each year; (B) building energy codes typically establish a “floor” for efficiency, not efficiency levels that are optimal in the context of aggressive climate policy; and (C) even optimal levels of efficiency improvements in buildings – though essential to enabling affordable decarbonization – will not be enough to achieve even close to a 40% emission reduction by 2040, let alone 80% by 2050.

¹² Tier 3 of Vermont's Renewable Energy Standard requires that utilities either procure more renewable distributed generation (DG) eligible for Tier II (a DG carve out) or acquire fossil fuel savings from “energy transformation” projects. These are projects that reduce fossil fuel consumed by utility customers.

¹³ Cowart, R., Neme, C. “The Clean Heat Standard.” An Energy Action Network White Paper. December 2021. P. 11.

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This “bottom up” approach is analogous to both EERS and electric RPS policies that currently exist in numerous U.S. states and Canadian provinces. It is fundamentally different from the top-down approach of an emissions cap in that it focuses on increases in “good things” (e.g., the number of emission-reducing measures installed or used) rather than on reductions in “bad things” (e.g., the total emissions still being produced). The ultimate effect on the volume of GHG emissions should be the same, as long as the CHS is periodically recalibrated to ensure that (1) the emission reduction benefits assumed to be associated with clean heat measures are accurately valued and credited; and (2) the number of CHS credits that must be produced is consistent with state goals. However, by effectively assigning economic value to different clean heat measures, a CHS approach potentially allows for a wider array of players – e.g., gas and electric utilities, other fuel providers, businesses that sell clean heat measures, and even end-use customers – to influence the range and mix of clean heat investments that will be made. In contrast, under an emissions cap, there is no direct market value that individual customers or businesses can monetize when installing or selling a clean heat measure. Of course, there are also advantages to an emissions cap, particularly lower levels of administrative complexity. Thus, the relative merits of a CHS versus an emissions cap will depend on local policy priorities and politics.¹⁴

A CHS IS A PERFORMANCE STANDARD THAT REQUIRES THERMAL FOSSIL FUEL SUPPLIERS TO DELIVER A STEADILY INCREASING PERCENTAGE OF LOW-EMISSION HEATING SERVICES TO CUSTOMERS.

COMPLIANCE IS DEMONSTRATED THROUGH A “BOTTOM UP” TALLYING OF ESTIMATED EMISSION REDUCTIONS FROM SPECIFIC, INDIVIDUAL MEASURES.

A CHS imposes thermal sector emission reduction obligations – often translated to a growing number of clean heat credits that must be produced each year – on thermal fossil fuel suppliers. However, there have been variations in which obligations are imposed on electric utilities (e.g., Vermont’s RES includes a “Tier III” requirement in which electric utilities must reduce their customers’ direct consumption of fossil fuels) as well as a proposal focused on

¹⁴ A comparison of the benefits and drawbacks associated with a credit-based system compared to a capping system is provided in the Appendix.

manufacturers or suppliers of heating equipment (in the United Kingdom).¹⁵ Additionally, as will be discussed below, regulators are proposing to include electric utilities in the mix of obligated parties in the Massachusetts CHS.

At a high level, a CHS can take different forms affecting the range of clean heat measures that are creditable as well as the extent to which clean heat credits can be generated by different market actors and traded (i.e., bought and sold). Generally-speaking, the CHS policies that have been adopted to date fall into one of the following three categories, listed from least to most expansive in terms of allowable measures and the ability to buy and sell credits:

- **Clean fuel standards.** Under a clean fuel standard, an increasing percentage of the fuel being delivered by an energy provider to its customers must be renewable or low-GHG; alternatively, the weighted average GHG-intensity of the fuel sold to customers must meet an increasingly stringent standard. This is the least flexible variation on a CHS in that the only measures typically allowed are different kinds of alternative fuels delivered by the regulated provider. This is analogous to an electric RPS. Reducing consumption through efficiency improvements or switching to energy provided by a different provider (e.g., through electrification) is typically not credited under a clean fuel standard. Depending on the jurisdiction, there can be trading of clean fuel credits between obligated parties.
- **Clean heat standards without credit trading.** A broader CHS policy allows for emission reductions to be achieved through a wider array of clean heat measures, including those that reduce energy consumption (i.e., efficiency improvements) and those that involve switching to a different energy provider (e.g., from gas to electricity).
- **Clean heat standards with credit trading.** This variation provides additional flexibility by allowing obligated parties who can more economically generate clean heat credits to over-comply with their own obligations and sell the excess credits to other parties who would otherwise fall short or find it comparatively more expensive to meet their obligations. This flexibility can be taken a step further by allowing any market actor to generate credits that can then be sold to an obligated party. For example, a heat pump

¹⁵ In 2023, the government drafted a straw proposal for stakeholder comment, designing a CHS for heating appliance manufacturers in which a defined portion of overall UK heating appliance sales to end-consumers would need to be low-carbon heat pump sales (https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1146981/clean_heat_market_mechanism.pdf).

installer or insulation contractor or even a home or business owner can generate credits to sell to gas utilities and/or other obligated parties.¹⁶

Examples of jurisdictions that have adopted these different approaches are discussed in Section 3.5 below.

3.4 The Case for a CHS

A CHS provides a consistent and clear signal to market actors – be they propane fuel deliverers, heating equipment installers, or regulated monopolies providing piped gas – that there is a monetary value, in the form of a clean heat (CH) credit, to reducing emissions in the thermal sector. A well-designed CHS can maximize flexibility and choice for all market actors. Entities like gas utilities that have to acquire CH credits (which are considered “obligated parties”) can have multiple ways to acquire the credits. This can include directly delivering efficiency measures, electrification measures and cleaner fuels to customers; hiring contractors to install measures; offering rebates to encourage customers to invest in measures themselves; and/or purchasing CH credits from other market actors.

THE VOLUNTARY NATURE OF CUSTOMER PARTICIPATION IS A CRITICAL AND KEY DESIGN ELEMENT OF A CHS.

Importantly, end-use customers also have a choice. They choose whether to participate and, if they participate, they choose the CH “measure” in which to invest. The voluntary nature of customer participation is a critical and key design element of a CHS. Equipment bans and similar policy mandates can make sense when carefully considered and crafted. However, in some cases they can be blunt instruments that create problems for some customers for whom a specific type of equipment does not work well (or requires much higher than average cost to become workable). While any policy that changes the status quo will likely create some opposition, policies that restrict individual choice are probably more likely to do so. A CHS offers an opportunity to change purchasing behavior while allowing for customer choice and flexibility.

¹⁶ Typically, ownership of credits would go to the building owner. However, contractors doing the work on the building could have their customers transfer the credits resulting from the work to them as part of the agreed-upon price for doing work on the building.

Examples of CH measures for customers can include weatherization, electric heat pumps, and low-emission fuels. Depending on the CHS design, CH credits can be created “upstream” in the market by producers/manufacturers/distributors (e.g., via renewable fuels) and/or “downstream” in the market by installers and end use customers (e.g., installing a measure within a building). The ability to monetize the GHG emission reduction value of the sale and installation of clean heat measures such as heat pumps, building weatherization, advanced wood heating systems, renewable district heating systems, and other measures, creates added incentive for businesses that sell such measures to grow and innovate, thereby lowering the overall societal cost of emission reductions. While other policies such as emissions caps can also incentivize such businesses, they will typically do so solely through programmatic incentives that are controlled by gas utilities and other obligated parties who offer them to the market. In contrast, a CHS structure that allows for credit trading amongst multiple market actors creates an inherent market value for CH measures.¹⁷

Finally, it is important to note that a well-designed CHS can work complementarily with other energy policies by providing an overarching performance standard to which other policies can contribute. For example, building performance standards, equipment efficiency standards, increased government funding of low-income weatherization programs, and other policies can be advanced to affect the mix of measures deployed to reduce GHG emissions from buildings and industry in ways that address equity, economic development, concerns about energy prices and/or other policy objectives. In many cases, investments in CH measures that result from such complementary policies can even earn CH credits, providing an additional revenue stream to support additional investments.

In sum, a CHS can provide:

- A consistent and clear market signal to prioritize lower emission heating options
- Flexibility for gas utilities and other fossil fuel companies to deliver emission reductions at lowest cost

¹⁷ Again, this inherent market value only exists if obligated parties buy clean heat credits generated by private sector businesses. However, in cases where there an obligated monopoly gas utility must submit a plan for CHS compliance, regulators can require that utility to invest in clean heat measures that are lower cost than other measures the gas utility may have preferred given its own business interest. In cases where the CHS design allows for private sector businesses and customers to generate and sell CH credits, the regulator can also require the gas utility(ies) to purchase such credits when they are lower cost than other alternatives the gas utility(ies) may have proposed.

- Customer choice
- Incentives to non-utility businesses to promote clean heat measures, grow and innovate
- An overarching umbrella policy structure under which other complementary policies can support emission reductions while addressing other policy objectives.

Additionally, market actors in the energy industry are familiar with performance standards, including renewable portfolio standards (RPS) and energy efficiency resource standards (EERS).¹⁸ Reviewing decades of performance standard experience, Cowart and Neme highlight five key elements of performance standards:

1. They offer change at scale
2. High prices are not required
3. The focus is on adding “good” resources, not on limiting “bad” resources
4. Regulators and others know how to administer them
5. They are designed to drive market competition, often resulting in lower costs and increased innovation.¹⁹

A performance standard designed for the thermal energy sector will differ from those designed for other sectors. Questions and issues specific to the thermal sector will need to be addressed in the design of a thermal performance standard. However, the underlying policy structure and implementation elements for performance standard policies are generally well understood and, critically, are achieving the intended policy goals.

3.5 Challenges of a CHS

The principal disadvantage of a CHS, especially one that allows for a range of market actors to generate and sell clean heat credits, is that it is more complex than alternatives such as an emissions cap or a carbon tax or equipment mandates. That complexity comes in many forms. For example, a CHS requires the establishment of credit values for different measures, as well as periodic updates to those values as better information on how much emissions are reduced by different measures is developed. A CHS also requires ownership rules for credits, as well as the tracking of credit sales or transfers from a potentially very large range of market players. In

¹⁸ <https://www.eia.gov/energyexplained/renewable-sources/portfolio-standards.php> and <https://www.aceee.org/topic/eers>

¹⁹ Cowart, R., Neme, C. “The Clean Heat Standard.” An Energy Action Network White Paper. December 2021. P. 13.

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contrast, an emissions cap simply requires assessment of the extent to which total emissions from regulated parties, such as individual gas utilities, have declined.

It is important to emphasize that the complexity of a CHS is eminently manageable. In many ways, it is comparable to the complexity of most states' design and oversight of EERS, which also require the counting up of estimated impacts from many different measures installed by many different customers as a result of initiatives influencing many different market channels. The question for states is ultimately whether the cost and administrative structure necessary to design and oversee a CHS is worth the potential benefits of allowing for a greater array of emission reduction options, for market players other than gas utilities and other obligated fossil fuel providers to have greater influence over the mix of emission reducing measures that are pursued and for the potentially greater levels of innovation in the market to emerge.

A second potential disadvantage of a CHS – at least relative to an emissions cap – is a risk that the exact amount of emission reduction required by a state will not be realized. Conceptually, this risk exists because of the deeming of emission reduction credit values for different clean heat measures. If the deemed values are higher or lower than the actual emission reductions measures are producing on average, total emission reductions could be higher or lower than planned. In contrast, an emissions cap theoretically regulates the actual amount of emissions being put into the atmosphere.

That said, if a CHS is well-designed, the risk that actual emission reductions will be significantly different from the levels desired should be extremely low. First, deemed emission reduction values should be periodically updated based on evaluation of actual impacts. Second, total emissions can and should be tracked. If such actual emission reductions appear to be diverging from estimated reductions based on deemed values, the size of the CHS emission reduction obligations imposed on gas utilities and other parties can be adjusted or recalibrated to put the state back on track to meet its goals. It is also important to note that an emissions cap which treats biofuels²⁰ as having emissions profiles that differ from the emissions that they produce at the “burner tip” also effectively requires “deeming” of emission reduction values (to reflect

²⁰ Note that we use the term biofuels in this report as an umbrella term that includes both liquid biofuels (e.g., biodiesel that might be used to displace fuel oil) and gaseous biofuels, including biomethane or what is often called renewable natural gas (RNG).

assumptions about lifecycle emission differences between fossil fuels and the biofuel alternatives).

3.6 Status Update: Review of Thermal Energy Policies

Several jurisdictions are currently considering or implementing a CHS or other requirement on entities providing heating services and fuel to buildings and industry. Table 2 below presents a list of recent initiatives, with most occurring in the last three years. The focus is on policies that have been enacted or on which significant developmental progress has been made. Not listed below are many commitments recently made by the U.S. Climate Alliance, a bipartisan coalition of 25 governors representing approximately 60% of the U.S. economy and 55% of the U.S. population, including six additional states that have committed to “explore the development of clean heat standards” (Connecticut, Hawaii, New Jersey, New York, Pennsylvania, and Rhode Island).²¹ It should be noted that CHS policy proposals and regulatory advances are frequent and ongoing; all four states highlighted in this paper are transitioning rapidly. Thus, portions of Table 2 and jurisdiction-specific information presented elsewhere in this report may be outdated, depending on when this report is being read.

Table 2. Status Update of Select Initiatives to Reduce Thermal Emissions

Jurisdiction	Fuels	Status
Clean Fuel Standards		
Oregon	Gas	2019 law requires the Oregon Public Utility Commission (PUC) to encourage delivery of renewable natural gas (RNG), with a goal of delivering 30% RNG by 2050. ²²
Rhode Island	Fuel Oil	2021 law requires home heating oil to be 10% biodiesel or renewable hydrocarbon diesel in 2023, 20% in 2025 and 50% in 2030. ²³
New York	Fuel Oil	Heating oil must contain at least 5% biodiesel by 7/1/22, 10% by 2025 and 20% by 2030. ²⁴
Connecticut	Fuel Oil	Heating oil must contain 5% biodiesel in 2022, 10% in 2025, 15% in 2030, 20% in 2034 and 50% in 2035. ²⁵

²¹<https://usclimatealliance.org/press-releases/decarbonizing-americas-buildings-sep-2023/>

²²<https://olis.oregonlegislature.gov/liz/2019R1/Downloads/MeasureDocument/SB98/A-Engrossed>

²³https://www.rilegislature.gov/pressrelease/_layouts/RIL.PressRelease.ListStructure/Forms/DisplayForm.aspx?List=c8baae31-3c10-431c-8dcd-9dbbe21ce3e9&ID=372028

²⁴ <https://www.nysenate.gov/legislation/bills/2021/S3321>

²⁵ <https://www.cga.ct.gov/2021/BA/PDF/2021HB-06412-R01-BA.PDF>

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France	Gas	In 2022, the government filed a decree to place an obligation on gas suppliers to obtain/file green certificates via injecting biogas directly into the gas system or purchasing certificates from biogas producers. ²⁶
Ireland	Gas	In 2022, the government agreed to introduce a Renewable Heat Obligation on the heat sector by 2024. Heat fuel suppliers can either directly deliver renewable fuel or purchase credits from other suppliers. Stakeholder input was solicited in 2021. ²⁷
Clean Heat Standards without Credit Trading		
Colorado	Gas	Per 2021 law, utilities are currently proposing/developing CH plans. ²⁸
Vermont	Electric	In 2016, as part of an update to its RPS (Tier 3), Vermont required electric utilities to run programs to meet increasing annual targets for reducing their customers’ direct consumption of fossil gas, fuel oil, propane, gasoline and other fossil fuels used in buildings, industry and transportation. Most of the reductions have resulted through electrification of home and business heating, as well as some industrial electrification.
Clean Heat Standards with Credit Trading		
Massachusetts	Gas, fuel oil, propane	Per the 2022 Massachusetts Commission on Clean Heat “Final Report,” in 2023 the Massachusetts Department of Environmental Protection initiated a Clean Heat Standard regulatory process. ²⁹
Maryland	Gas, fuel oil, propane	Maryland has adopted binding requirements to reduce GHG emissions below 2006 levels by 60% by 2031 and 100% by 2045. The Department of Environment is initiating a rulemaking process in 2024. ³⁰
Vermont	Gas, fuel oil, propane	Per 2023 law, regulations are being developed through the PUC. The Legislature must re-vote on proposed rules in 2025. ³¹ Vermont’s electric utility RPS Tier 3 requirement to reduce customers consumption of fossil fuel remains in place, with those reductions (expected to be less than 20% of what is needed to meet Vermont’s 2030 emission reduction goal) becoming creditable (saleable) under the new CHS imposed on fossil fuel companies.

²⁶ <https://www.legifrance.gouv.fr/jorf/id/JORFTEXT000045653118>

²⁷ <https://www.gov.ie/en/press-release/83757-government-agrees-to-the-introduction-of-an-obligation-on-the-heat-sector-by-2024/>

²⁸ <https://puc.colorado.gov/cleanheatplans>

²⁹ <https://www.mass.gov/orgs/commission-on-clean-heat>

³⁰ <https://mde.maryland.gov/programs/air/ClimateChange/Maryland%20Climate%20Reduction%20Plan/Maryland%27s%20Climate%20Pollution%20Reduction%20Plan%20-%20Final%20-%20Dec%2028%202023.pdf>

³¹ <https://legislature.vermont.gov/bill/status/2024/S.5>

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3.6.1 Colorado

Colorado enacted a CHS in 2021. The clean heat statute established 2015 as a reference year and required emission reductions relative to that reference year of 4% by 2025 (of which not more than 1% can come from recovered methane) and a 22% reduction by 2030 (of which not more than 5% can come from recovered methane); reduction requirements beyond 2030 are to be set by the PUC.³² Additionally, the PUC “shall establish a cost cap that is two and one-half percent of annual gas bills for all full-service customers as a whole.”³³ However, the PUC “may approve, or amend and approve, a clean heat plan with costs greater than the cost cap only if it finds that the plan is in the public interest, costs to customers are reasonable, the plan includes mitigation of rate increases for income-qualified customers, and the benefits of the plan, including the social costs of methane and carbon dioxide, exceed the costs.”³⁴

Colorado’s statute, 40-3.2-108, defines clean heat resources as follows:

(c) “Clean heat resource” means any one or a combination of:

- (I) Gas demand-side management programs as defined in section 40-1-102 (6);*
- (II) Recovered methane;*
- (III) Green hydrogen;*
- (IV) Beneficial electrification as defined in Section 40-3.2-106 (6)(a);*
- (V) Pyrolysis of tires if the pyrolysis meets a recovered methane protocol; and*
- (VI) Any technology that the commission finds is cost-effective and that the division finds results in a reduction in carbon emissions from the combustion of gas in customer end uses or meets a recovered methane protocol approved by the Air Quality Control Commission. To qualify as a clean heat resource, all credits or severable, tradable mechanisms representing the emission reduction attributes of the clean heat resource must be retired in the year generated and may not be sold.”³⁵*

Statute further articulates the definition of (c)(II) above (recovered methane), as:

(n) “Recovered methane” means any of the following that are located in Colorado and meet a recovered methane protocol approved by the Air Quality Control Commission:

³² Note that this is a broad overview of the Colorado statute. There are many other details, such as delineations in requirements depending on the size of the gas utility, that are not being presented in this high-level overview.

³³ Note that the cost cap applies only to spending over and above what the gas utilities would already spend on their core system-wide energy efficiency programs. §40-3.2-108 (6)(a)(I), C.R.S.

³⁴ §40-3.2-108 (6)(d)(III), C.R.S.

³⁵ §40-3.2-108 (2)(c)(I-VI)), C.R.S.

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- (I) Biomethane; and*
- (II) Methane derived from:*
 - (A) Municipal solid waste;*
 - (B) The pyrolysis of municipal solid waste;*
 - (C) Biomass pyrolysis or enzymatic biomass; or*
 - (D) Wastewater treatment;*
- (III) Coal mine methane, as defined in Section 40-2-124 (1)(a)(II), the capture of which is not otherwise required by state or federal law; or*
- (IV) Methane that would have leaked without repairs of the gas distribution and service pipelines from the city gate to customer end use.”³⁶*

The Public Utilities Commission adopted initial rules to support implementation of the statute in November 2022. Those rules included requirements for utilities to file plans that include (1) a scenario in which emission reductions are maximized within the cost cap; (2) a scenario in which the statutory emission reduction goals are met even if the cost cap is exceeded; and (3) any additional scenarios the utility wants considered.

Public Service Company (also referred to as PSCo and/or Xcel Energy), the state's largest utility, filed its first Clean Heat Plan in August of 2023. In that plan, PSCo estimated that it could achieve less than one-quarter of the state's 2030 emission reduction goal within the 2.5% cost cap. It further suggested that strategies to achieve the 22% emission reduction target through additional gas DSM, electrification, hydrogen and methane recovery – i.e., measures explicitly included in statute – would require exceeding the cost cap by a factor of nearly nine. In addition, PSCo's original preferred approach proposed the use of CNG and offsets – i.e., measures not explicitly allowed under statute. The Company estimated that its preferred approach would only require expenditures about six times as great as the cost cap. An alternative analysis prepared by the Southwest Energy Efficiency Project (SWEET) and Natural Resources Defense Council (NRDC) suggested that a strategy that relied solely on electrification and weatherization of buildings (if it focused on promoting efficient heat pumps as alternatives to central air conditioner replacements), could reach the statutory emission reduction objective at an average annual cost comparable to PSCo's preferred scenario.³⁷

³⁶ §40-3.2-108 (2)(n), C.R.S.

³⁷ Justin Brant (SWEET), “Gas Utility Decarbonization in Colorado,” presented at the 2023 ACEEE National Conference on Energy Efficiency as a Resource, October 18, 2023 (https://www.aceee.org/sites/default/files/pdfs/EER23%20Program%20%28Presentation%20Links%29_0.pdf).

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In September of 2023, several non-profits joined together to file a Joint Motion for Partial Summary Judgment, stating that the Colorado Public Utilities Commission (PUC) “cannot lawfully approve the Company’s preferred Clean Heat portfolio” because its reliance on “certified” natural gas (CNG) and emissions offsets was statutorily prohibited.³⁸ Following this filing, the PUC determined that further discussion and process was needed to clarify whether CNG and offsets were clean heat resources. PSCo has withdrawn its proposal for CNG and offsets to count towards their emissions reduction targets in this CHP, and has been granted additional time to file an amended application.³⁹

In comparison to CHS under consideration in Vermont, Massachusetts and Maryland (described next), Colorado’s law does not allow for emission reduction credits to be traded between obligated gas utilities; nor does it create a market in which non-utility parties can generate and sell credits to the obligated gas utilities. Colorado’s Clean Heat law reflects the unique characteristics of Colorado’s energy landscape, as well as what was considered politically achievable. Regarding the energy landscape, Colorado’s thermal energy needs are served primarily by gas utilities, with slightly under 70% of Colorado households using gas as their primary home heating source. This is followed by electricity at about 26% of home heating share and then propane at ~5%; there is very little “delivered fuel.”⁴⁰ Additionally, current decision makers in Colorado have tended to favor an approach to decarbonization that focuses on many sector-specific initiatives rather than an economy-wide approach such as a cap-and-invest policy or carbon tax.

Colorado’s approach is significantly different from those being contemplated in Vermont, Massachusetts and Maryland, but there are still lessons to be learned by comparing and contrasting policy design elements. Feedback about Colorado’s CHS varied amongst the multiple stakeholders interviewed for this paper. For example, one interviewee stated that Colorado’s approach is preferable to the administrative lift involved in creating a new compliance market (as the Eastern states are considering). Another interviewee commented that Colorado’s CHS reflects contradictions resulting from the state’s historical and current energy politics and policies. Yet another interviewee stated that Colorado’s CHS was structured

³⁸ Joint Motion for Partial Summary Judgment. Proceeding No. 23A-0392EG. September 6, 2023. Filed by the City of Boulder et al. p. 1.

³⁹ Interim Commission Decision. Proceeding No. 23A-0392EG. November 1, 2023. Public Utilities Commission of the State of Colorado.

⁴⁰ Colorado State Energy Profile. United States Energy Information Administration. <https://www.eia.gov/state/print.php?sid=CO>

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to ensure that all gas utilities — regardless of size, ownership model, regulatory structure and energy portfolio (e.g., dual fuel or gas only) — could be included in the CHS. This stakeholder views Colorado’s CHS as an appropriate addition to Colorado’s other policies, which are making strides in deploying and increasing renewables, energy efficiency and strategic electrification while striving for affordability. This interviewee commented that one area of current learning is how to work with gas utilities to share detailed, specific gas system plans and maps so that electrification occurs strategically via neighborhoods rather than singular buildings. More details regarding Colorado’s process will be discussed throughout this paper.

3.6.2 Vermont

In Vermont, a CHS bill was considered by the Legislature in 2022, but it was vetoed by the Governor and failed to override the veto by one vote. Between spring of 2022 and January of 2023, considerable discussion occurred between stakeholders, resulting in a new bill, the “Affordable Heat Act.” This bill, Senate 5, was also vetoed by the Governor, but the veto was overridden. A key element of S5 is the requirement that, after the Vermont PUC has developed all regulations, the proposed rule must be voted on again by the Legislature in 2025, in order for a CHS to be enacted. Key areas of modification from the 2022 bill to the 2023 bill included the development of significant guardrails around the usage of biofuels, including biomethane (often referred to as renewable natural gas or RNG), and the addition of several requirements to address affordability concerns for low- and moderate-income Vermonters. The PUC is now working to develop all required regulations for review, discussion and a revoting by the Legislature by January 2025.

Vermont benefited from the work of a diverse group of Vermont energy professionals and stakeholders who met regularly from the Fall of 2021 through January of 2023 to develop an initial CHS design that was drafted into legislation, and then modified repeatedly to gain broad stakeholder support.⁴¹ As a result of this process, the Vermont statute is different in a number of respects from Colorado’s.

⁴¹ See more about this stakeholder group at <https://www.eanvt.org/network-action-teams/clean-heatstandard/>. Members of this group included Chris Neme and Gabrielle Stebbins of Energy Futures Group. Richard Cowart of Regulatory Assistance Project and Mr. Neme co-led the working group. Ms. Stebbins, the primary author of this paper, is also a Vermont State Representative; in this capacity she voted on both of Vermont’s bills related to a CHS.

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Key elements of the Vermont statute include:⁴²

- Comprehensive inclusion of all entities selling and sectors using non-electric energy sources to meet thermal needs. Obligated parties are “a regulated natural gas utility serving customers in Vermont,” and “for other heating fuels, the entity that imports heating fuel for ultimate consumption within the State, or the entity that produces, refines, manufactures, or compounds heating fuel within the State for ultimate consumption within the State.”⁴³
- A requirement that the PUC must “establish or adopt a system of tradeable clean heat credits earned from the delivery of clean heat measures that reduce greenhouse gas emissions.”⁴⁴ However, these credits can be created (or, installed) by any entity, and then sold to an obligated party. Among other things, this means that emission reductions produced by obligated entities can come from any home or business and not necessarily from their own customers.
- Clarity that a clean heat measure means “fuel delivered and technologies installed to end-use customers in Vermont that reduce greenhouse gas emissions from the thermal sector. Clean heat measures shall not include switching from one fossil fuel use to another fossil fuel use”⁴⁵, and “emission offsets, wherever located, shall not be eligible measures”⁴⁶.
- Allowance of biofuels, including RNG, but within a construct of set lifecycle carbon intensity levels which are ratcheted down over time. The PUC must also periodically review “the sustainability of the production of clean heat measures by considering factors including greenhouse gas emissions; carbon sequestration and storage; human health impacts; land use changes; ecological and biodiversity impacts; groundwater and surface water impacts; air, water, and soil pollution; and impacts on food costs.”⁴⁷
- Significant (and specific) requirements to serve low- and moderate-income households and multiple programmatic reviews to ensure energy burden is not increased.

Vermont is distinct from many other jurisdictions, including Colorado, in that there is only one piped gas utility that serves only about 20% of Vermont households, all in the northwestern part of the state. Indeed, the vast majority of buildings in Vermont are heated with delivered

⁴² Vermont’s Affordable Heat Act includes many more specific requirements; these will be presented throughout the remainder of this paper.

⁴³ 30 V.S.A. Chapter 94. §8123. (12)(A) and (B).

⁴⁴ 30 V.S.A. Chapter 94. §8122.(b).

⁴⁵ 30 V.S.A. Chapter 94. §8123.(3).

⁴⁶ 30 V.S.A. Chapter 94. §8127.(j).

⁴⁷ 30 V.S.A. Chapter 94. §8128. (a)(3).

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fuels (e.g., No. 2 fuel oil, propane, wood and kerosene). Vermont also has the second lowest population, at about 650,000. This creates a different dynamic when discussing how to reduce emissions from the thermal sector; rather than working with a few, large, monopoly utilities, the Vermont policy involves one gas utility and many, smaller “mom and pop” fuel delivery companies.

Similar to Colorado, Vermont has robust energy efficiency offerings. However, the opportunity for building energy code to drive significant improvements in building energy consumption is limited due to (a) the minimal new construction that is occurring and (b) the lack of energy code enforcement across the state.⁴⁸ While Vermont is dissimilar to many other states with far more robust gas infrastructure systems, the structure and design of its CHS policy still offers much to consider.

3.6.3 Massachusetts

In September of 2021, Governor Charlie Baker signed Executive Order 596, establishing a first-in-the-nation Commission on Clean Heat. Meanwhile, the Regulatory Assistance Project wrote “A Clean Heat Standard for Massachusetts” as an appendix to Massachusetts’ 2025/2030 Clean Energy and Climate Plan, released in July of 2022. A few months later, the Clean Heat Commission issued its’ Final Report, which recommended the Massachusetts Department of Environmental Protection (MassDEP) be directed “to initiate a regulatory process to establish a Massachusetts Clean Heat Standard, with a stakeholder process to begin immediately.”⁴⁹

In March of 2023, MassDEP released a CHS discussion document and draft regulations regarding emissions reporting requirements for heating fuel suppliers, requesting stakeholder input. Topic areas for which the MassDEP requested response included:

1. Setting the standard
2. Regulated heating energy suppliers
3. Credit generation

⁴⁸ Only a few cities in Vermont have code enforcement for residential buildings. Vermont energy code administration is currently under discussion by many stakeholders. Stakeholder discussions are available for review in the December 1, 2023 report entitled “Act 47 Building Energy Code Study Committee Report to the Vermont Legislature,” available at <https://publicservice.vermont.gov/efficiency/building-energy-standards/building-energy-code-study-committee>. 2024’s House bill 792, reflecting some portion of these recommendations, has been introduced for the 2024 legislative session. <https://legislature.vermont.gov/Documents/2024/Docs/BILLS/H-0792/H-0792%20As%20Introduced.pdf>

⁴⁹ Massachusetts Commission on Clean Heat. Final Report. November 30, 2022. P. 19.

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4. Compliance flexibility and revenue
5. Reporting requirements for heating energy suppliers
6. Interactions with other programs
7. Economic analysis.

MassDEP received significant detailed responses, as well as the recommendation to, essentially, take a step backward to provide a series of webinars to explain what a CHS is and how it might work. This level-setting work occurred throughout spring and summer of 2023.

In November of 2023, MassDEP released a draft framework for stakeholder comment, stating that “all aspects of program design are open for comment.”⁵⁰ The framework proposes a CHS that, actually, includes two standards, one requiring “full electrification” of a set number of residences and another requiring annual emissions reductions from space heating demand (only) in residential and commercial buildings (thus, water heating and other thermal processes are not included). Obligated parties include all heat providers, with electricity provider requirements increasing over time as fuel providers witness decreased sales; alternative compliance payments and banking of credits are also proposed.

The framework includes several provisions designed to meet equity considerations. For example, 25% of the required residential full electrification conversions must be met by projects that serve customers who are eligible for low-income discount electricity rates. Additionally, a “Just Transition Fee” of 10% of the annual full electrification credit alternative compliance payment value would be required for the first transfer of each full electrification credit that is not eligible for the equity carve out (with funds assisting low-income consumers). Eligible measures/activities include full and hybrid electrification projects that address space heating and eligible liquid biofuels.

Massachusetts’ proposal provides a unique counterpoint to Vermont’s legislation. Vermont’s approach provides greater flexibility to obligated parties and consumers, including many more creditable options with greater specificity in program design and implementation. In contrast, Massachusetts regulators appear to be focused on program simplicity, while also ensuring that direct installations of heat pumps occur and that lower income residents are provided an opportunity to participate in space heating electrification.

⁵⁰ MassDEP Clean Heat Standard (CHS) Draft Framework for Stakeholder Comment Only. November 2023. P. 1. <https://www.mass.gov/doc/chs-draft-program-framework>

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3.6.4 Maryland

Maryland’s “Climate Solutions Now Act” of 2022 reset GHG emission targets to 60% below 2006 levels by 2031 (up from a 2016 target of 40% by 2030) and placed a 2045 deadline for achieving economy-wide net-zero GHG emissions. It also created a statewide building energy performance standard that requires most buildings over 35,000 square feet to start reporting direct heating emissions beginning in 2025; these buildings must then achieve a 20% emissions reduction by 2030 (from the 2025 baseline) and net-zero by 2040.⁵¹ Within this landscape, the Maryland Department of the Environment (MDE) began exploring the potential role of a CHS, with presentations in February and August of 2023 to the Commission on Climate Change Mitigation Working Group, covering the basics of what a CHS is and how it might work in Maryland.⁵² In the Fall of 2023, the Regulatory Assistance Project completed “Meeting the Thermal Challenge: A Clean Heat Standard for Maryland” on behalf of the MDE, including policy considerations and recommendations and highlighting key policy decision points. Finally, the MDE released “Maryland’s Climate Pollution Reduction Plan: Policies to Reduce Statewide Greenhouse Gas Emissions 60% by 2031 and Create a Path to Net-Zero by 2045” in late December 2023, including recommendations for a CHS.

The CHS is presented as part of a suite of building-emission reduction policies, building off of policies such as energy codes and standards, electric vehicle (EV) ready and solar-ready standards for new buildings, building energy performance standards, a “State Government Lead by Example” initiative, EmPower (focused on electric efficiency), ongoing state incentives for building decarbonization, and proposing new policies such as a zero-emission heating equipment standard, the CHS, and gas system planning.⁵³ Specific CHS policy design elements mentioned in the Climate Pollution Reduction Plan include selecting gas utilities, heating oil and propane importers as obligated parties; allowing for third parties to participate in the CHS by creating credits (and then presumably selling them to obligated parties); providing opportunities for technologies such as networked geothermal systems; and, potentially

⁵¹ St. John, J. “Maryland just passed one of the most aggressive climate laws in the US.” April 12, 2022. Canary Media. <https://www.canarymedia.com/articles/policy-regulation/maryland-just-passed-one-of-the-most-aggressive-climate-laws-in-the-us>

⁵² See meeting materials from February 16 and August 20, 2023, available at:

<https://mde.maryland.gov/programs/air/ClimateChange/MCCC/Pages/MWG.aspx>

⁵³ Maryland’s Climate Pollution Reduction Plan: Policies to Reduce Statewide Greenhouse Gas Emissions 60% by 2031 and Create a Path to Net-Zero by 2045. December 28, 2023. P. 34 – 43.

<https://mde.maryland.gov/programs/air/ClimateChange/Maryland%20Climate%20Reduction%20Plan/Maryland%27s%20Climate%20Pollution%20Reduction%20Plan%20-%20Final%20-%20Dec%2028%202023.pdf>

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allowing for alternative fuels such as biomethane, biodiesel, woody biomass, hydrogen and other alternative fuels for high-heat applications utilizing a lifecycle emissions analysis. A rulemaking process will be initiated in 2024, with draft regulations proposed before 2025.⁵⁴

The remainder of this paper will describe the key design elements to be considered when designing a CHS. While CHS deployment is relatively nascent everywhere, there are already opportunities to learn from the varying approaches taken by different jurisdictions.

4. Design Elements and Recommendations for a CHS

While one of the benefits of a CHS policy is its relative flexibility, the initial design structure should be as clearly defined as possible in order to achieve the intended goal: to drive heating providers to offer lower-emitting heating choices to customers in alignment with the jurisdiction's emission reduction targets in a manner that is affordable. Policy design considerations of a CHS include:

- 4.1 Determining the scope of the CHS
- 4.2 Determining the size of the obligation
- 4.3 Defining the obligated party
- 4.4 Defining the nature of the obligation
- 4.5 Determining which activities or measures are eligible
- 4.6 Specific questions pertaining to credit-based CHS
 - 4.6.1 Determining the ways in which credits can be acquired
 - 4.6.2 Setting the value for credits
 - 4.6.3 Credit banking/borrowing
- 4.7 Setting cost containment mechanisms
- 4.8 Ensuring compliance
 - 4.8.1 Evaluating and verifying compliance
 - 4.8.2 Setting penalties for non-compliance
 - 4.8.3 Creating a default delivery agent
- 4.9 Designing for equity.

⁵⁴ Ibid. P. 41.

Each of the sections below begins with key CHS design questions, followed by discussion, the authors' recommendations and a review of how various jurisdictions are approaching the selected CHS design element.

4.1 Determining the scope of a CHS

Key questions:

- *Should the policy address only residential and commercial building fossil fuel consumption, or include the industrial sector as well?*
- *Should the policy address only fossil gas, or address fuel oil, propane and other delivered fuels as well?*

“Should the policy address only residential and commercial building fossil fuel consumption, or include the industrial sector as well?”

At the start, a CHS should be grounded and built upon the respective jurisdiction's thermal emissions goals. Proposals to focus on thermal emissions from certain sectors only, such as residential and commercial buildings but not industrial buildings and processes, can seem sensible in approach but ultimately splinter and weaken the market signal that a credit-based CHS should create. There are a number of compelling reasons to include “hard-to-decarbonize” sectors such as industrial (and manufacturing), as provided below.

- **Industrial emissions also need to be reduced.** To meet a jurisdiction's emission reduction targets, industrial emissions will also have to be reduced – if not through a 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 largely the same as those used in residential and commercial buildings. And in most cases, they are 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 increasing regulatory and administrative 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

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of clean heat measures would be applicable. It would be inefficient to treat identical commercial and industrial end uses in different ways through different regulations. Doing so can 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, the availability of biofuels such as renewable natural gas (RNG) is very limited – and, particularly if consumed at significant scale, will have a very high cost.⁵⁵ Thus, it is critical 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 a CHS is targeted exclusively to the residential and commercial sectors, gas utilities may have less incentive to strategically consider how best to use limited RNG supplies. 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.

THERE ARE IMPORTANT SYNERGIES IN ADDRESSING INDUSTRIAL EMISSIONS UNDER THE SAME POLICY AS RESIDENTIAL AND COMMERCIAL EMISSIONS.

“Should the policy address only fossil gas, or address fuel oil, propane and other delivered fuels as well?”

Ideally, the CHS should address all fossil fuels. The rationale for this is similar to the above. If the intent of the CHS is to drive the market towards lower emitting energy sources, then exempting certain fuel types from the CHS not only weakens the market signal, it could also

⁵⁵ For example, a 2019 report completed for the American Gas Foundation estimated that RNG would cost \$7 to \$45 per MMBTU (or, more than 2 to over 15 times the current market price for natural gas, trading ~\$3/MMBtu in early January 2024), and a California Energy Commission study estimated even greater costs for synthetic methane. American Gas Foundation, “Executive Summary—Renewable Sources of Natural Gas: Supply and Emissions Reduction Assessment,” prepared by ICF International, December 2019. <https://www.gasfoundation.org/wp-content/uploads/2019/12/AGF-2019-RNG-Study-Executive-Summary-Final-12-18-2019-AS-1.pdf>. EIA, <https://www.eia.gov/naturalgas/weekly/> (accessed January 15, 2024). California Energy Commission, “Natural Gas Distribution in California’s Low-Carbon Future,” October 2019. <https://ww2.energy.ca.gov/2019publications/CEC500-2019-055/CEC-500-2019-055-D.pdf>.

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potentially result in customers shifting from the included fuel source (e.g., piped gas) to the exempt fuel source (e.g., fuel oil #2). While this may be an option for customers, if the CHS is to be as effective as possible, then the choice should come with an associated cost, as determined by the CHS design.

However, this approach does result in additional complexity because of the need to address many more and smaller obligated parties (e.g., fuel dealers). Ultimately, how important it is to include delivered fuels (or not) in the CHS will vary by state. In states where the combustion of delivered fuels makes up a very small percentage of total thermal sector emissions, inclusion of delivered fuels will be less important. In states where delivered fuels result in a greater percentage of total thermal emissions (e.g., the Northeast), then inclusion will be more important to ensure the CHS results in the intended emissions reductions.

Recommendations

- The CHS scope should apply to all thermal sectors, including residential, commercial and industrial sectors.
- The CHS scope should ideally apply to all conventional fossil fuels, including fossil gas, fuel oil, propane and other delivered fuels (although the importance of this determination will vary by state).

Field Applications

Colorado's statute does not cover all customers; it applies to "full service" but not "transportation gas service" customers. These transportation service customers purchase their gas from third party suppliers, with the utility acting solely as the transporter of the fuel to the customer. These transportation service customers are generally large industrial consumers. As mentioned earlier, Colorado is approaching decarbonization through the use of multiple sector-specific policies. For the transportation service customers not served by the Clean Heat law, the assumption is that the Colorado Air Quality Control Commission's "Greenhouse Gas Emissions and Energy Management for Manufacturers in Colorado" (GEMM) will act as the driver towards decreased emissions.⁵⁶ Statute and regulation is generally silent regarding customer type (except for references to income qualifying customers), instead referring more generally to the

⁵⁶ <https://cdphe.colorado.gov/greenhouse-gas-emissions-and-energy-management-for-manufacturing-in-colorado>

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need to reduce “carbon emissions from the combustion of gas in customer end uses...”⁵⁷ Colorado’s CHS focuses on gas utilities and does not include delivered fuels.

In Vermont, the CHS covers all sectors and includes all delivered fuels and gas providers. Specifically, statute requires that obligated parties reduce GHG emissions from the Vermont thermal sector, defined as the “‘Residential, Commercial and Industrial Fuel Use’ sector as used in the Vermont Greenhouse Gas Emissions Inventory and Forecast and does not include nonroad diesel or any other transportation or other fuel use categorized elsewhere in the Vermont Greenhouse Gas Emissions Inventory and Forecast.”⁵⁸ Note that this definition excludes electricity — a topic that will be discussed further in Section 4.3.

In Massachusetts, the MassDEP has asked stakeholders for feedback regarding “setting the standard.” The draft framework presented in November of 2023 focuses on space heating for both residential and commercial buildings and includes all types of fuel and energy (including electricity). Fossil fuels (and electricity) used for water heating or various other commercial processes are not included, nor is the industrial sector mentioned in the framework. While some stakeholders commented that the scope should include residential, commercial and industrial emissions during the first round of comments, this did not occur in the second proposal drafted by MassDEP.

Meanwhile, Maryland statute currently prevents emissions due to manufacturing from being included in a CHS. Thus, either statute would need to be modified or a different policy would be required to address this sector. In this instance, Maryland provides a good example of how CHS policies will vary by state, depending on the existing legal, regulatory and market structures in place. The December Climate Plan states a “CHS requires natural gas utility companies and heating oil and propane importers to reduce the GHG emissions associated with their businesses following a schedule set by MDE.”⁵⁹ Thus, it appears as though all fossil fuels will be included.

⁵⁷ §40-3.2-108 (2)(c)(6) C.R.S.

⁵⁸ 30 V.S.A. Chapter 94 §8123(13).

⁵⁹ Maryland’s Climate Pollution Reduction Plan: Policies to Reduce Statewide Greenhouse Gas Emissions 60% by 2031 and Create a Path to Net-Zero by 2045. December 28, 2023. P. 40.
<https://mde.maryland.gov/programs/air/ClimateChange/Maryland%20Climate%20Reduction%20Plan/Maryland%27s%20Climate%20Pollution%20Reduction%20Plan%20-%20Final%20-%20Dec%2028%202023.pdf>

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4.2 Determining the size of the obligation

Key questions:

- *What is the total emission reduction the CHS will be designed to achieve from buildings and industry, and over what timeframe(s)?*
- *Can emission reduction requirements be modified periodically?*
- *Should the CHS reduction requirements represent the total emissions reductions needed from the thermal sector (e.g., with other complementary policies contributing and generating CHS credits in the process), or just the additional reductions needed over and above those that will be generated through other policies?*

“What is the total emission reduction the CHS will be designed to achieve from buildings and industry, and over what timeframe(s)?”

The size of the clean heat obligation should increase over time and in step with climate requirements. Similar to renewable portfolio standards, the concept of a CHS is not to cut off access to energy but rather to drive the addition of cleaner options into the overall mix. Requiring a planned, stepped increase in clean heat requirements with regularly occurring checks and balances by regulators (and, when needed, by legislators) can ensure ongoing access to heat while complying with climate targets.

The statutory requirements of a CHS do not need to be annual; if statutory mandates are set in 5-year increments, the CHS statute can also. However, market actors will need clarity as to their annual requirements. The annual requirements for the CHS can be regulatorily determined (with public input) via model results estimating the percentage decrease needed from the thermal sector in an integrated and coordinated fashion with decrease requirements from other sectors. From there, an annual percentage amount can be set for each obligated party. 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 utility's 2023 fossil fuel sales to residential, commercial and industrial customers was equal to 10% of a

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state's total 2023 emissions from those customers, then that utility would be required to meet at least 10% of the statewide thermal emission reductions required for 2025.⁶⁰

“Can emission reduction requirements be modified periodically?”

To ensure that long-term policy goals are met, regulators should be given authority to modify the level of obligation if needed. This can be upward, if data shows that credits are significantly oversupplied, or downward, if it is clear that there are unmitigable market factors at play (e.g., economic, technical or supply problems). For example, Vermont has a 2030 requirement for 40% emission reduction from 2018 levels. The PUC can create CHS credit requirements for each obligated party that it believes, say in 2024, would be sufficient to reach the 2030 goal. However, those requirements would be based on current forecast of population growth, economic growth, naturally occurring changes in energy use/patterns, etc. The setting of these requirements also includes the averaging of credit values assigned to various CH measures (heat pumps, weatherization, pellet stoves, etc). However, no forecast is going to be perfect. If population and economic growth are slower than expected, fewer CH credits will be needed to reach 2030 emission goals. If CH credit values for heat pumps or other measures are overstated for a couple of years (they should also be periodically updated based on best available info), then emissions reductions from these actions will be less than forecasted. Thus, it is important that regulators be authorized to periodically revise/update the number of CH credits that obligated parties are required to produce each year to ensure targets are met. Certainly, any modifications should be supported by data and receive public input; and any reduction in the CHS should only occur within clearly defined, strict conditions.

“Should the CHS reduction requirements represent the total emissions reductions needed from the thermal sector (e.g., with other complementary policies contributing and generating CHS credits in the process), or just the additional reductions needed over and above those that will be generated through other policies?”

One important issue to consider is whether the number of clean heat credits that obligated parties are required to generate is equal to the state's total emission reduction requirement or just the portion of the requirement that is not expected to be captured by current and/or

⁶⁰ Note that there may need to be a time lag between the reference year for allocating emission reductions and the year in which emissions need to be reduced, 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.

future complementary policies. For example, consider a state that has a goal of reducing GHG emissions from the thermal sector by 40% by 2030 and that expects current or expanding low-income weatherization programs, current or expanding gas utility efficiency resource standards, current or future rental energy performance standards, rebates and tax credits from the federal Inflation Reduction Act, and other current and expected future policies to reduce thermal sector GHG emissions by 10%. That state has a choice of either (1) requiring gas utilities and other obligated parties to document acquisition of clean heat credits equivalent to a 40% emission reduction, with emission reductions resulting from other current and future parties earning clean heat credits (i.e., counting towards CHS requirements); or (2) requiring acquisition of clean heat credits equivalent to a 30% emission reduction, with emission reductions resulting from other current and future policies not earning credits (i.e., not counting towards the CHS requirements).

For several important reasons, the first option — making the CHS an over-arching umbrella policy with emission reduction requirements equal to the total needed and allowing emission reductions from other complementary policies to earn credits and count towards CHS obligations — should be preferred. First, this approach eliminates the need to accurately forecast the size of the emission reduction that the complementary policies will produce. In the example above, if complementary policies end up producing only 8% emission reductions instead of 10%, the 30% required of the CHS would result in not meeting the state goal. Conversely, if the complementary policies end up producing 12% reductions instead of 10%, the CHS would result in over compliance. While the CHS targets should be periodically recalibrated, less recalibration will be needed — providing more certainty for obligated parties — if emission reductions from complementary policies are nested under the CHS umbrella. Second, nesting emission reductions from complementary policies under the CHS umbrella eliminates the need to determine which investments in clean heat measures are attributable to the CHS. This is important in a world in which there are multiple potential funding streams for the same clean heat measures. Third, eliminating the need to make attribution determinations should reduce confusion in the market. If attribution is required, gas utilities and other CHS obligated parties would compete with rather than collaborate with other organizations in promoting investments in clean heat measures.

Some stakeholders sometimes object to the concept of allowing emission reductions from other policies and programs to count towards CHS targets — arguing that this is “double-counting.” However, that label is inaccurate and misleading. Emission reductions are still

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counted only once towards CHS requirements. As long as the CHS requirements are equal to the state's total emission reduction goal, there should be no issue.

As discussed further in Sections 4 and 5, states may still wish to promote a host of complementary policies, in part to address policy objectives other than emission reductions. For example, a state may increase investment in low-income weatherization and adopt rental efficiency standards for multi-family buildings to address equity concerns. Similarly, a state may increase gas utility efficiency program savings requirements to ensure emission reductions are achieved in a least cost manner, to pre-emptively address the importance of reducing peak demand on the electric grid (e.g., if it is assumed that many gas-heated homes will eventually have to electrify), and/or to maximize local economic development and job growth. A state may also require its electric utilities to invest in electrifying fossil-heated buildings – as Vermont essentially has (see discussion below) – if it believes that would help produce a more balanced mix of clean heat measures. In all these examples, the investments in weatherization, other gas efficiency investments and electrification investments would be eligible to earn clean heat credits that could be sold to gas utilities and/or other obligated parties, creating a revenue stream to help the entities making those investments to pay for them. In this way, complementary policies nested under an over-arching, umbrella CHS have the effect of shaping the mix of clean heat measures used to meet state goals rather than affecting what emission reduction goals are achieved.

Recommendations

The CHS obligation should:

- Align with thermal emissions reductions needed to comply with climate mandates
- Increase over time
- Include regulatory authority to set and revisit requirements to ensure state emission reduction goals are achieved
- Be designed as an over-arching, umbrella policy, with the number of clean heat credits required to equal the state's total emission reduction goals and with reductions produced through other current or future complementary policies nested under the CHS and therefore creditable and counting towards the CHS obligations.

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Field Applications

All four states reference existing statutorily set emission-reduction mandates, proposing a methodology to calculate obligated parties' share of reductions, and then direction to regulators to provide further refinement.

In Colorado, gas distribution utilities must meet clean heat targets “compared to a 2015 baseline, a four percent reduction in greenhouse gas emissions in 2025...and a twenty-two percent reduction in greenhouse gas emissions in 2030.”⁶¹ Planning periods beyond 2030 are to be determined by the PUC.⁶² Additional guidance regarding how emissions should be calculated and reported are provided in statute and regulations. Colorado law also states that “if the commission determines that it is possible to achieve larger greenhouse gas emission reductions than the required clean heat targets using clean heat resources at or below the cost cap, the commission shall require the maximum level of emission reductions above the clean heat targets that can be achieved at or below the cost cap using clean heat resources....”⁶³

Vermont statute requires the Public Utilities Commission to “establish the number of clean heat credits that each obligated party is required to retire each calendar year,” with the size of the requirements pegged to the level required for the thermal sector to meet its proportional share of the state’s emission reduction goals (as specified in 10 V.S.A. §578(a)(2) and (3) or the Global Warming Solutions Act).⁶⁴ In this way, the policy nests emission reductions that will be produced by other policies under the CHS, making them creditable (i.e., counting towards CHS obligations). That includes current and future state investments in low-income weatherization, Efficiency Vermont’s investment in thermal efficiency measures, and requirements that were imposed on the state’s electric utilities (in “Tier 3” of the 2016 update to the state’s RPS) to achieve annually increasing levels of reduction in their customers’ direct consumption of fossil fuel consumption. In other words, all emission reductions from those existing policies (and any future ones) can be sold to and purchased by the state’s gas utility and fuel dealers as part of their demonstration of CHS compliance. Vermont’s statute also states that “Annual requirements shall be expressed as a percent of each obligated party’s contribution to the thermal sector’s lifecycle CO₂e emissions in the previous year. The annual percentage

⁶¹ §40-3.2-108. (3)(II), C.R.S.

⁶² §40-3.2-108. (4)(h), C.R.S.

⁶³ §40-3.2-108. (6)(d)(II)(A), C.R.S.

⁶⁴ 30 V.S.A. Chapter 94. §8124.

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reduction shall be the same for all obligated parties.”⁶⁵ Vermont statute further directs the PUC to establish and update annual credit requirements for the next decade (through 2033), extending the requirements every three years for three years, and if necessary “revise the pace of clean heat credit requirements for future years to ensure that the thermal sector portion of the emission reduction requirements” of the Vermont Global Warming Solutions Act for 2030 and 2050 are achieved.⁶⁶ Similar to Colorado, additional guidance is provided regarding how emissions are to be calculated and reported.

MassDEP’s CHS Stakeholder Discussion Document states that “the standard must be set with reference to the building sector emissions sublimits established in the [Clean Energy and Climate Plan for 2025 and 2030].” The building sector sublimits stem from a process involving quantitative analysis and qualitative stakeholder feedback to achieve economy-wide emissions reductions in line with Massachusetts’ 2008 Global Warming Solutions Act (GWSA).⁶⁷ The GWSA required the Secretary of the Executive Office of Environmental and Energy Affairs to establish a statewide emissions limit for 2050 that is at least 80% below the 1990 baseline emissions level. The GWSA also required/s the setting of interim limits for 2020, 2030, and 2040.⁶⁸ The most recent, November 2023, draft framework from MassDEP does increase over time and include regulatory authority to revisit and update requirements.⁶⁹ However, given the focus on space heating, the limited range of creditable actions and the fact that the current proposal only addresses residential and commercial buildings, it is challenging to state that the CHS as currently proposed in Massachusetts would play the role of an over-arching, umbrella policy.

The Maryland Climate Pollution Reduction Plan states that the “CHS is modeled to avoid annual GHG emissions of 0.8 MMTCO_{2e} in both 2031 and 2045,” and refers to obligated parties reducing their emissions “following a schedule set by MDE.”⁷⁰ The Plan further states that a CHS “complements and supports the achievement of other policies including energy codes and

⁶⁵ Ibid.

⁶⁶ Ibid.

⁶⁷ In Massachusetts, the term “emission limits” refers to economy-wide emissions while “sublimits” refers to sector specific reduction targets.

⁶⁸ <https://www.mass.gov/info-details/massachusetts-clean-energy-and-climate-plan-for-2025-and-2030>

⁶⁹ MassDEP Clean Heat Standard (CHS) Draft Framework for Stakeholder Comment Only. November 2023. P. 3, 4. <https://www.mass.gov/doc/chs-draft-program-framework>

⁷⁰ Maryland’s Climate Pollution Reduction Plan: Policies to Reduce Statewide Greenhouse Gas Emissions 60% by 2031 and Create a Path to Net-Zero by 2045. December 28, 2023. P. 41 and 40, respectively. <https://mde.maryland.gov/programs/air/ClimateChange/Maryland%20Climate%20Reduction%20Plan/Maryland%27s%20Climate%20Pollution%20Reduction%20Plan%20-%20Final%20-%20Dec%2028%202023.pdf>

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standards, EmPOWER, BEPS, and ZEHES. As a sector-specific policy, it ensures that decarbonization proceeds at the pace needed to achieve the state’s goals.”⁷¹ Thus, MDE appears to be approaching a CHS with a goal of implementing a measured, increasing emissions reduction requirement designed to provide an overarching structure to reduce building sector emissions.

4.3 Defining the obligated party

Obligated parties may include:

- Regulated investor-owned gas utilities
- Municipal gas utilities
- Competitive gas suppliers
- Delivered fuel providers (wholesalers or retailers)
- Electricity providers.

As discussed in Section 4.1, the authors recommend that the scope of a CHS include fossil gas as well as fuel oil #2, propane, and other delivered fuels. Thus, the authors suggest that obligated parties include regulated, investor-owned gas utilities, municipal gas utilities, competitive gas suppliers and, in states where delivered fuels represent a significant fraction of fossil fuel used in buildings, delivered fuel providers.⁷² Because of the size and scale of thermal emissions reduction requirements, the inadequate pace with which current strides are being made, and the need for a strong, consistent market signal, we suggest applying a broad brush when determining obligated parties, including all gas utilities regardless of size or ownership as well as delivered fuel providers.⁷³

⁷¹ Ibid. P. 40.

⁷² The authors recognize that mining companies create emissions throughout the extraction, processing, and transmission of fossil fuels used for heat. We do not recommend including mining companies in a CHS, as what a CHS regulates is the end-use consumption of fossil fuels in the thermal sector.

⁷³ Note that larger, regulated gas utilities can play a unique role in a CHS. They can bring financial strength and engineering/technical prowess to the decarbonization transition, for example by transforming areas from a piped gas system to a district-wide, networked geothermal system.

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Remaining key questions include:

- *If suppliers of unregulated fuels are included, should the obligation be imposed on wholesalers or on retail fuel dealers?*
- *Should the obligation be imposed on electric utilities since much of the emission reductions are likely to be achieved via electrification, thereby increasing electricity consumption?*

“If suppliers of unregulated fuels are included, should the obligation be imposed on wholesalers or on retail fuel dealers?”

For delivered fuels, there are benefits and challenges regarding whether to impose the obligation on wholesalers versus retailers. For example, imposing the obligation on wholesalers could, presumably, result in fewer obligated parties and therefore less administrative burden. However, this option may not be possible. If wholesalers are not located within the jurisdiction considering a CHS, then the jurisdiction/state would not have the authority to require compliance, and interstate commerce rules would be violated.

However, imposing the obligation on retail fuel dealers presumably results in having many more obligated parties to oversee and regulate. Furthermore, depending on the size of the retail fuel dealer, having to comply with a CHS could be challenging (e.g., if the company is particularly small). Yet one benefit to placing the obligation with retail fuel dealers is that they have a direct relationship with customers. Therefore, they have an opportunity to educate customers (often, though not always, the building owner) regarding energy options and to work with them on heat-switching choices. Ultimately, the determination as to whether the obligation is placed on the wholesaler or retailer may require legal and market research to assess how fuel is being brought and sold into the state. This research should inform the decision as to where to place the obligation.

“Should the obligation be imposed on electric utilities since much of the emission reductions are likely to be achieved via electrification, thereby increasing electricity consumption?”

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Although electric utilities (investor-owned, municipal and co-operatives) could potentially be obligated parties, we do not recommend this, at least not in the near- to medium-term. In many states, electric utilities are already complying with other regulatory programs to reduce emissions, for example in RPS and/or electric efficiency programs. Moreover, any current emissions from the electric sector are going to have to be largely (if not entirely) eliminated through future regulation if states are to meet economy-wide emission reduction goals. If additional costs are imposed on the electric sector to reduce emissions from fossil fuel consumption in buildings and industry – rather than on the sector that sells the fossil fuels to those customers – 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.

*A FUNDAMENTAL PREMISE
OF A WELL-DESIGNED CHS IS
THAT IT IS THE POLLUTER
WHO PAYS.*

This brings up a fundamental premise of a well-designed CHS (and most well-designed energy policies): that it is the polluter who should be responsible for reducing pollution. Assigning the CHS obligation to the entities responsible for creating emissions appropriately places the requirement to enact change on the accountable market actors.

Some parties may raise concerns about the long-term viability of placing all of the burden/cost of decarbonizing buildings and industry on gas utilities and other fossil fuel suppliers. In particular, there may be questions about whether the resulting increases in gas rates, for example, will become socially problematic, particularly for customers who do not have the means to electrify or for whom electrification or other forms of fuel-switching are challenging. Some may suggest moving some of the CHS obligation to electric utilities at such a future point in time. Given the uncertainty about the extent to which this will become a problem that needs “fixing,” it is best to not begin with the presumption that the obligation will need to be shifted to electric utilities. If necessary, this concern could get addressed by building in future “check-ins” on the issue, with an opening for “course corrections” that may involve shifting of obligations. Any such future changes should be informed by experience in the early years with all of the obligation on fossil fuel companies. They should also be considered in the context of how a future shifting of CHS obligations to electric utilities will affect the customer economics of electrification. It may be okay if such a shift only modestly reduces the economic benefits of electrification. However, it will be problematic if shifting part or all of the CHS obligation to

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electric utilities means that electrification will go from providing some annual heating bill savings for the average customer to annual heating bill increases. The extent to which shifting obligations to electric utilities will significantly affect the customer economics of electrification will depend on local climate, energy prices and other factors.

Other categories for obligated parties could include large commercial properties that consume a certain threshold of fuel (to ensure that homeowners are not included) and/or landlords with a certain level of real estate square footage. The line of connection between cause-and-effect regarding thermal emissions is not quite as strong for these market actors as compared to fuel energy providers, but depending on the other policies in place within the respective jurisdiction, it may make sense to consider obligating owners of large buildings – particularly when the building owner owns the heating equipment but the tenants pay the energy bills.⁷⁴ However, the consideration as to whether or not to make large commercial property owners obligated parties should not be done in a vacuum. Specifically, there are currently 22 jurisdictions that are considering or have building performance standards.⁷⁵ For these 22 jurisdictions, policy makers must carefully consider how a potential building performance standard may interact with a potential CHS.

Ultimately, there should be stakeholder discussion as to who is and is not an obligated party. Depending on stakeholder participation, other entities not mentioned in this paper could be identified as potential obligated parties. While the purpose of a CHS is to drive thermal emissions reductions, there are other benefits such as spurring new economic development and supporting existing energy companies to cultivate new lines of business. Including stakeholders in the development of the CHS can assist in new, creative insight as well as, hopefully, greater buy-in to the policy as a whole.

It should be noted that placing a CHS obligation on entities not typically regulated by a PUC may (or may not) present new issues for regulators. In Vermont, PUC testimony highlighted concerns about ensuring that all of the defined obligated parties are identified; depending on

⁷⁴ This non-alignment of who owns the equipment and who pays the energy bills is referred to as the “split incentive,” and has been a perennial challenge in the energy efficiency industry.

⁷⁵ Nadel, S. and Hinge, A. “Mandatory Building Performance Standards: A Key Policy for Achieving Climate Goals.” May 2023. American Council on an Energy Efficiency Economy Report. <https://www.aceee.org/sites/default/files/pdfs/B2303.pdf>

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the state, there may be many smaller fuel delivery providers.⁷⁶ Once identified, ensuring consistent compliance from entities not used to being regulated in this fashion, may or may not take time. To address compliance – particularly smaller retail fuel dealers or municipal gas utilities – one administrative option is to identify another entity to assist in administration (referred to as a “Default Delivery Agent,” or DDA, and discussed further in Section 4.8.3).

Recommendations

- Obligated parties should include all entities selling gas, including regulated and unregulated entities as well as investor-owned, municipal and competitive gas suppliers.
- Determining the obligated party (wholesaler or retailer) for delivered fuels may require legal and market research, and may vary by state.
- Electricity providers should not be obligated parties, at least not in the near- to medium-term. If there are concerns about the viability of requiring fossil fuel companies to bear all of the burden of decarbonizing buildings in the long-term, future “check-in” points can be built into CHS policies to allow for assessments of whether or to what extent shifting some of the burden to electric utilities can be accomplished without creating significant adverse effects on the customer economics of electrification.
- Energy extraction companies should not be included within a CHS, as this would not deliver thermal emissions reductions in buildings and businesses within the respective jurisdiction.

Field Applications

As mentioned in Section 3, Colorado has few delivered fuel entities. This fact underpins why Colorado’s policy focuses on gas utilities.

Vermont, on the other hand, is dominated by delivered fuel entities with only one gas utility serving the northwestern part of the State. Thus, Vermont’s policy focuses on the one gas utility and “for other heating fuels, the entity that imports heating fuel for ultimate consumption within the State, or the entity that produces, refines, manufacturers, or compounds heating fuel within the State for ultimate consumption within the State.”⁷⁷

⁷⁶ One way to ensure identification of all fuel delivery providers is to leverage other state reporting requirements. For example, in Vermont, a time-limited sharing of contact information between the state tax department and the PUC was required so the PUC could acquire the list of businesses who report fuel sales.

⁷⁷ 30 V.S.A. Chapter 94 §8123.(12).(B).

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Participants in Vermont’s CHS working group (mentioned earlier) spent considerable time discussing whether the obligated party should be the wholesale provider or the retail provider. As mentioned earlier, placing the obligation at the wholesale level would have reduced the administrative effort to oversee compliance, as there are fewer wholesale entities. However, it is the companies selling delivered fuel to the end use consumer who ultimately have a relationship with the customer, and therefore could potentially “touch” each building in a direct fashion that, if the CHS is designed effectively, could result in building owners selecting clean heat resources rather than conventional equipment and fuel (either when the heating equipment fails or earlier). Indeed, testimony by delivered fuel companies during the legislative process indicated that many of these companies – though not all – were already offering some clean heat resources (as defined in Vermont), such as cold climate heat pumps, advanced wood heating systems and biofuels. Ultimately, retail fuel dealers were selected to be the obligated parties in Vermont’s CHS. This was due, in large part, to the fact that there were out-of-state wholesalers selling fuel to Vermonters; requiring compliance across state lines was not an option.

Interestingly, Vermont implemented a form of a CHS in 2015, as part of its initial renewable portfolio standard, which Vermont statute calls Renewable Energy Standard (RES). Specifically, Vermont’s RES includes a third Tier, which requires that Vermont’s monopoly, vertically-integrated electricity providers assist electric ratepayers in reducing emissions associated with fossil fuel consumption in the thermal and transportation sectors. Tier 3 of Vermont’s RES remains intact under the new CHS. However, because its emission reductions count towards the CHS credit requirements, the electric utilities will now be able to sell the emission reductions that they produce to fossil fuel suppliers, effectively defraying electric utility costs.

Massachusetts falls between Colorado and Massachusetts – with several gas utilities and several delivered fuel entities. The March 2023 Stakeholder Discussion Document states that “the basic CHS concept would assign compliance with the standard to suppliers of fossil heating fuels (natural gas, heating oil, and propane),” and then articulates the challenges mentioned previously – that some of the smaller delivered fuel companies “may find reporting emission and purchasing credits to be administratively challenging.” Thus, one of the questions MassDEP asked stakeholders was “how can compliance be streamlined for small fuel suppliers?” In the March 2023 document, MassDEP also explores whether municipally owned gas and electric utilities should be treated differently than gas-only utilities and delivered fuel entities, and whether electric energy suppliers should be obligated parties. Stakeholder comments:

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*were divided on whether the electricity sector should have a compliance obligation. Those suggesting that the electricity sector be included in the compliance obligation noted that there are greenhouse gas emissions associated with electricity generation and that the sector will expand under the CHS...Other commenters pointed out that increasing electricity prices is in conflict with the goal of electrification and this sector should not have a compliance obligation.*⁷⁸

Fast forward to MassDEP’s November 2023 draft framework, and it appears as though all liquid fuel providers (gas, oil, propane), and electricity providers, may be obligated parties. Further, “the requirements for electricity sellers would be set in line with current building electrification programs (i.e., Mass Save) in the early years of implementation, and then increase gradually to ensure long-term viability of the standard as fuel providers’ customer base declines due to electrification.”⁷⁹ Additionally, “the full electrification compliance obligations for retail sellers of electricity (including municipal electric utilities) would initially be set at a level not exceeding levels consistent with electric energy efficiency three-year plans, such as for example 16,000 full conversions per year.”⁸⁰ And from 2027 onwards, the obligation on electricity sellers would increase annually.

As discussed above, we generally advise against obligating electricity providers, especially in the initial design of a CHS policy, although MassDEP’s rationale to do so is understood: 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, the pace at which electric utilities’ obligations grow is a critical issue. It may be difficult to convince customers to electrify if doing so will result in higher rather than lower (or at least similar) annual heating costs. Massachusetts electric rates are already relatively high, especially compared to fossil gas rates, in part because current policies to drive investment in decarbonization of the grid have not been matched by policies requiring investment by gas utilities in decarbonization of buildings. Thus, it may be challenging to convince current gas heating customers to electrify today. Moreover, the electric sector will incur additional grid decarbonization costs in the future — as well as costs to serve newly electrified building and

⁷⁸ Clean Heat Standard. 2023 Initial Stakeholder Comments. P. 3. <https://www.mass.gov/doc/clean-heat-standard-comment-summary/download>

⁷⁹ MassDEP Clean Heat Standard (CHS) Draft Framework for Stakeholder Comment Only. November 2023. P. 3. <https://www.mass.gov/doc/chs-draft-program-framework>

⁸⁰ Ibid.

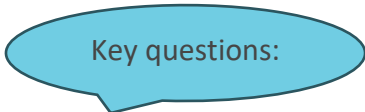
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transportation loads. Put simply, requiring electric utilities to also pay for most of the cost of decarbonizing fossil fuel use in buildings may create a price gap between electricity and fossil fuels – particularly fossil gas – that may make it more difficult to achieve the electrification objectives of the clean heat standard. Thus, if a jurisdiction considers including electricity providers as an obligated party (which we do not recommend), then at the least, the size of fossil fuel companies’ collective obligations for both electrifying homes and emission reductions should be larger than electric utility obligations at least until it is clear that shifting the obligation would not have significant adverse effects on the customer economics of electrification.

The language pertaining to a CHS in Maryland’s Climate Plan suggests that MDE plans to include all providers of fossil gas, fuel oil #2 and propane as obligated parties (but not electricity providers).

4.4 Defining the nature of the obligation



Key questions:

- *How will the CHS be measured?*
- *At what level will the CHS be measured?*

“How will the CHS be measured?”

A CHS can be measured in a number of ways: number/size/type of equipment, number of gallons, amount of square footage being weatherized and more. However, we recommend that the common denominator be carbon dioxide equivalent (CO₂e) – assuming that the jurisdiction has set an emissions reduction target. This approach clearly aligns the CHS with the climate mandates which it is supposed to support. This approach also allows for many clean heat activities to be calculated on the same basis, providing an apples-to-apples comparison across measure type.

“At what level will the CHS be measured?”

The level at which CO₂e reductions are measured is typically broken down into either the site level or source level emissions. Figure 1 below provides a graphic explanation of how these two levels account for energy use within the electricity sector. Site level refers to consumption at

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and within the building, while source level refers to energy used from point of extraction/generation to combustion within the building. However, in the context of a CHS, emissions reduction requirements for gas utilities do not include the extraction and processing of the gas. For a CHS, the farthest “upstream” point at which tracking of emissions typically occurs is the point at which the obligated party owns the fuel, with tracking continuing to include all emissions that occur downstream from that point. Note that there can be some ambiguity as to where tracking begins either at the state/jurisdiction line or by the obligated party. Generally, states are utilizing CHS to reduce in-state thermal emissions and therefore are focused on reducing emissions occurring from combustion within the state.

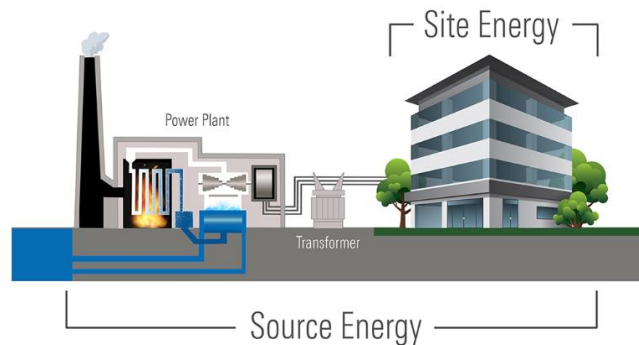


Figure 1. Site versus Source Energy⁸¹ within the Electricity Sector

For downstream credit activities such as a heat pump installation or weatherization project, we recommend using the site level CO₂e value (also referred to as the “burner tip” measurement). First, it is administratively easier to regulate burner-tip emissions. Second, a state generally has no control over emissions upstream of its borders. Third, if emissions are reduced at the burner tip, by definition any emissions upstream will also be reduced. The only thing that focusing on burner-tip doesn't allow for is valuing purchases of some forms of fossil fuels differently than others (e.g., certified gas, which will be discussed more fully in Section 4.5). Fourth, for downstream activities, measuring at the site level reflects the point at which the activity is occurring: building owners can change out heating equipment and reduce consumption. In a deregulated state, they may also be able to control where their electricity comes from through retail choice – but this is not necessarily so for building owners in regulated jurisdictions. The

⁸¹ https://www.energystar.gov/buildings/benchmark/understand_metrics/source_site_difference

potential for significantly high uncertainty in calculating lifecycle (source level) emissions reductions from, say, a heat pump installation in a single-family home argues for determination at the site level. This approach is also aligned with many jurisdictions' climate mandates.

However, biofuels should be treated differently. Any credits associated with injecting or burning biofuels should only receive credits on a net basis, after accounting for the full lifecycle emissions resulting from the making and burning of said biofuel. The rationale for this is two-fold: first, to prevent the possibility of “exporting” emissions across jurisdictions and second, to ensure that potential negative impacts from increased biofuel consumption is counted (e.g., creation of new methane to meet the CHS obligation and ongoing, under-reported leakage). More discussion on the potential role of biofuels is provided in Section 4.5.

Recommendations:

- CHS activities should be measured in CO₂e.
- Eligible activities should be measured at the site level (or at the “burner tip”), except for biofuels, which should be calculated by netting out the CO₂e savings from the full lifecycle emissions of the biofuel.

Field Applications

Colorado's CHS is clear that emissions and reductions should be measured in CO₂e. Colorado's standard states that:

all emissions are metric tons of carbon dioxide equivalent as reported to the federal environmental protection agency pursuant to 40 CFR 98, either Subpart W (Methane) or Subpart NN (Carbon Dioxide), or successor reporting requirements; except that the division shall use the AR-4 one-hundred-year global warming potential or any greater successor value determined by the Federal Environmental Protection Agency.⁸²

Additionally, baseline and projected emissions must include: (1) “methane leaked from the transportation and delivery of gas from the gas distribution and service pipelines from the city gate to the customer end use,” (2) CO₂ emissions “resulting from the combustion of gas by residential, commercial, and industrial customers not otherwise subject to federal greenhouse gas emission reporting and excluding all transport customers,” and (3) methane leakage from

⁸² §40-3.2-108 (3)(c)(II), C.R.S.

delivery of gas to other local distribution companies.⁸³ Additional guidance is provided in the Code of Colorado Regulations.⁸⁴ As mentioned earlier, PSCo originally filed a preferred plan that would have assumed emissions from far upstream of the “burner tip” (e.g., via CNG and offsets). While this proposal has been shelved, it remains to be seen what future plans will propose.

Meanwhile, Vermont’s statute mirrors the recommendations listed above. With the regulatory process just beginning, it remains to be seen how statute will be interpreted as details are fleshed out.

MassDEP’s November 2023 draft framework utilizes CO₂e to inform the underlying requirements for both the residential electrification requirement standard and the emissions reduction standard. However, the emissions reduction standard is more directly related to actual emissions reductions, while the residential electrification requirement standard utilizes more of a “yardstick” approach. This will be described further in Section 4.6.2, which discusses setting specific values for credited activities.

MassDEP’s approach to biofuels does not reflect the recommendation that emission reductions resulting from biofuel use should be measured by netting out the CO₂e savings from the full lifecycle emissions of the biofuel. Rather, the November 2023 draft framework proposes 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.”⁸⁵ We assume that MassDEP’s November 2023 proposal is purposely designed to be relatively simplistic so that emissions reduction mandates and electrification projects are “kick started” in the near term. However, as will be described in Section 4.5, there are disadvantages to basing biofuel credits on such a simplified scoring system (full credit, half credit or no credit) rather than on more granular assessments of lifecycle GHG impacts.

⁸³ Both citations in this paragraph can be found in §40-3.2-108(3)(c)(I), C.R.S.

⁸⁴ 4 Colo. Code Regs. § 723-4. 4525, 4526, and 4527.

⁸⁵ MassDEP CHS Draft Framework for Stakeholder Comment Only. November 2023. P. 6.

<https://www.mass.gov/doc/chs-draft-program-framework>

MDE briefly mentions biofuels (including RNG), and also mentions lifecycle emissions. However, specific detail as to how various alternative fuels may be measured is not provided. With the MDE's Climate Plan referencing "Meeting the Thermal Challenge: A Clean Heat Standard for Maryland," though, it can be inferred that MDE is likely inclined to measure credits in CO₂e.

4.5 Determining which activities or measures are eligible

Key questions:

- *Should switching from fossil fuels to biofuels be an allowable CHS measure and, if so, with what guardrails?*
- *Should biomass be an allowable CHS measure?*
- *Should switching from one fossil fuel to a lower-GHG fossil fuel be an allowable CHS measure?*
- *Should all energy efficiency measures, including efficient fossil fuel burning equipment, be eligible CHS measures?*
- *Should electrification and other measures be limited to those that are most efficient and therefore provide the greatest emission reductions?*
- *Should "certified" natural gas be an eligible CHS measure?*
- *Should emissions offsets be an eligible CHS measure?*
- *Should hydrogen be an eligible CHS measure?*

A CHS is a performance standard, not a technology mandate. As described in "A Clean Heat Standard for Massachusetts," this is a critical factor for at least three reasons:

1. *Ultimately, end-use customers need to install their own heating equipment and choose their energy suppliers. Buildings differ, consumer preferences differ, and even the same consumers will choose different heating systems as their budgets and preferences change over time.*
2. *A performance standard creates competitive pressure across technologies and fuels, which will lower the total costs of the heating transition and help to drive innovation, both in technology and in service delivery pathways.*
3. *The fundamental purpose of the Clean Heat Standard is to reduce emissions, not to promote certain technologies for extrinsic reasons. The standard needs to include guardrails to ensure that unsustainable or clearly undesirable choices are not*

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rewarded, but within a range of solutions it should allow customers, providers and markets to choose clean heat paths.”⁸⁶

Conceptually, any measure that reduces GHG emissions could potentially be considered a clean heat measure. However, there are a variety of reasons for potentially limiting the range of measures that can be eligible to earn clean heat credits:

- Some measures that provide only modest and/or short-term emission reductions can be incompatible with achieving – or make it more expensive or challenging to achieve (e.g., by putting off more fundamental changes that will be needed) – medium and/or longer-term goals of much larger emission reduction requirements
- Some measures “lock-in” technology and/or fuel choices for customers that cannot easily or economically be changed for 15-20 years or more, reducing the range of emission reduction options in the medium-term and longer-term and/or reducing customers’ practical flexibility to adjust to potentially fast-changing energy economics
- Some measures create other environmental or social harms
- Some measures may not actually provide net emission reductions once regulations needed to achieve global elimination of GHG emissions in other jurisdictions and/or in other sectors are considered.

In the balance of this section we address several key ways in which it may be appropriate to restrict the range of GHG reducing measures that should be considered eligible to earn clean heat credits.

“Should switching from fossil fuels to biofuels be an allowable CHS measure and, if so, with what guardrails?”

Whether/how to include biofuels as an eligible activity in a CHS is a highly debated policy consideration. Indeed, many of the four cautionary bullets listed above can and do apply to biofuels. However, including biofuels as an eligible activity may be recommended, particularly if done so with strict conditions. Guardrails to be considered include:⁸⁷

⁸⁶ “A Clean Heat Standard for Massachusetts.” Appendices to the Massachusetts Clean Energy and Climate Plan for 2025 and 2030. Appendix B. P. 60 – 61. Written by Regulatory Assistance Project for the Commonwealth of Massachusetts. July 2022. <https://www.mass.gov/doc/appendices-to-the-clean-energy-and-climate-plan-for-2025-and-2030/download>

⁸⁷ All of these, other than a cap on the portion of emission reductions that can come from biofuels (including RNG), were included in the Clean Heat Standard enacted in Vermont (the Affordable Heat Act of 2023).

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1. Requiring a lifecycle accounting of GHG emissions from any renewable gas that receives a credit. It is critical to recognize that not all sources of RNG are equal. Figure 2 below shows a range of global warming potential (GWP) based on lifecycle carbon intensities for various feedstocks – *up to the point of pipeline injection* – based largely on Argonne National Laboratory’s GREET model (but specific to Michigan). Note that the lowest carbon intensities are from feedstocks that prevent the release of fugitive methane (e.g., manure), and that these feedstocks, along with food waste, are the only types resulting in a negative carbon intensity. This assumes that the facilities (dairy and landfill) would otherwise be releasing methane, rather than capturing or flaring the gas (this is further discussed in #4 below).

TO ENSURE CLIMATE GOALS ARE MET, RNG AND OTHER BIOFUELS SHOULD ONLY BE ALLOWABLE CHS MEASURES IF CREDIT VALUES ARE BASED ON LIFECYCLE EMISSION IMPACTS AND OTHER IMPORTANT GUARDRAILS ARE PUT IN PLACE.

2. It is also critical to account for leaks throughout the gas system. Although there are various attempts underway in different jurisdictions to reduce leaks, invariably they occur throughout the entire gas system. Thus, even if there is a reduction of emissions due to, say, capturing methane at a livestock facility when it was previously freely released, there are most certainly methane leaks occurring from the point of generation to combustion.

For example, one Stanford study found that “natural gas stoves emit up to 1.3% of the gas they use as unburned methane.”⁸⁸ Meanwhile, a 2021 Massachusetts study observed no changes in the level of methane emissions in the Boston area over a period of eight years even though significant effort and cost was invested in the Commonwealth’s Gas System Enhancement Program.⁸⁹ Does this mean new leaks are developing elsewhere in the gas grid? Or that more leaks are occurring within buildings? The answer is not known, but one fact is clear: significant leakage is occurring. Another study focusing on the influence of methane feedstocks and leakage rates found that

⁸⁸ <https://news.stanford.edu/2022/01/27/rethinking-cooking-gas/>

⁸⁹ Sargent, et al. (2021). Proceedings of the National Academy of Sciences 118 (44) e2105804118 <https://www.pnas.org/doi/10.1073/pnas.2105804118>

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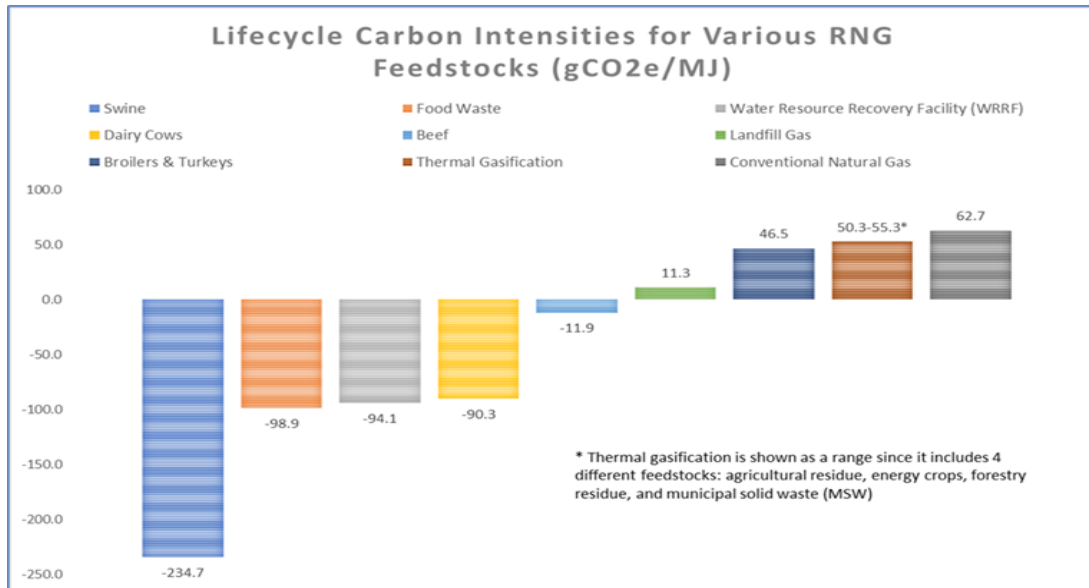


Figure 2. Lifecycle GHG emission factor ranges for RNG feedstocks (in Michigan)⁹⁰

“anticipated leakage is climatically significant: literature estimates for methane leakage from biogas production and upgrading facilities suggest that leakage is in the 2% -4% range (mass basis), up to as much as 15%. Policy makers should consider that under reasonable leakage and demand assumptions, renewable natural gas could be climate intensive.”⁹¹

Thus, the lifecycle accounting should reflect, to the extent practical, best estimates (accounting for local circumstances) of actual emissions impacts and only use default assumptions when absolutely necessary.⁹²

3. Requiring a contractual pathway for delivery of RNG, just as would be necessary for fossil gas. As explained earlier, the CHS must successfully reduce emissions from within

⁹⁰ Michigan Public Service. (September 23, 2022). Michigan Renewable Natural Gas Study. Final Report. Submitted by ICF Resources, L.L.C. P. 119. Graph developed from Table B-1. <https://www.michigan.gov/mpsc/-/media/Project/Websites/mpsc/workgroups/RenewableNaturalGas/MI-RNG-Study-Final-Report-9-23-22.pdf?rev=213e31ab46c24ce1b799eeb8a42f0824&hash=5B8C2CEB98C8F8F20C7D65F4C4153CE1>

⁹¹ Grubert, E. (2020). Environ. Res. Lett. 15 084041 <https://iopscience.iop.org/article/10.1088/1748-9326/ab9335/pdf>

⁹² Note, for example, the Environmental Defense Fund’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>

buildings and businesses in the respective jurisdiction.⁹³ Thus, it is insufficient for an obligated party to simply acquire the environmental or renewable attributes of a given fuel. For any credits to be received, obligated parties must also be able to show a physical pathway from the point of generation to point of combustion within the respective jurisdiction.

For trucked biofuels displacing kerosene, fuel oil, propane, and gas this would mean that only biofuels showing an end delivery point in the respective jurisdiction could receive credit. As Cowart and Neme explain, additional rules are needed to ensure that biogas (RNG) is delivered to a state:

The concept of deliverability is a little more complicated in the context of the pipeline delivery system for methane gas because it is not possible to trace which molecules of methane are burned in which homes and businesses. Thus, for pipeline biogas, deliverability could be satisfied by purchase and sale of what is sometimes called “a ‘bundled’ product.”⁹⁴

Specifically, an obligated party must purchase the biogas, including its GHG emission reduction attributes, *and* have a physical pathway for delivery of the biogas from the point at which it is injected into a pipeline all the way to the distribution system of the obligated party. This approach is similar to many RPS policies, where the renewable energy and the environmental attribute (or Renewable Energy Certificate, REC) must both be purchased, *and* the renewable energy must be generated within the same transmission system as the entity claiming ownership for the RECs.

4. Limiting credit eligibility to only RNG sources that exist already, absent the Massachusetts CHS and/or similar policies in other jurisdictions. New sources of biofuels whose emergence can be tied in whole or in part to the CHS market should not be credited. This can be considered a “but for” principle for biofuels. Using RNG as an example, the rationale for such a principle is that RNG emits the same amount of GHG when burned as fossil methane. Thus, the burning of RNG can produce emission reductions only if its capture and combustion eliminates atmospheric emissions of methane and/or other GHGs that otherwise would have occurred. If a new source of RNG is created because of market demand driven by CHS and/or related policies,

⁹³ This CHS principle is also one of the reasons for the recommendation that purchasing carbon offsets be ineligible to receive credits (presented later in the paper).

⁹⁴ Cowart, R., Neme, C. “The Clean Heat Standard.” An Energy Action Network White Paper. December 2021. P. 27.

burning of that RNG does not provide any offsetting emission reductions because, by definition, they would not have been occurring absent the CHS policy. An example of a creditable RNG source could be the development of a new biogas recovery system at an existing farm not currently capturing any methane. An example of an ineligible source is a new dairy farm created, at least in part, because of the economic value of the methane it could produce, capture and sell.

5. Precluding biofuels from receiving CHS credits if they are shown to create other environmental and/or social harms (mentioned earlier). This can include deforestation or forest degradation, conversion of grasslands, increased emission of criteria pollutants, damage to watersheds, etc. The Vermont CHS statute reads:

The PUC shall biennially assess harmful consequences that may arise in Vermont or elsewhere from the implementation of specific types of clean heat measures and shall set standards or limits to prevent those consequences. Such consequences shall include environmental burdens as defined in 3 V.S.A. § 6002, public health, deforestation or forest degradation, conversion of grasslands, increased emissions of criteria pollutants, damage to watersheds, or the creation of new methane to meet fuel demand.⁹⁵

6. Establishing maximum lifecycle carbon intensity scores for biofuels. The argument for this guardrail is that it eliminates short-term fixes and encourages focus on increasingly longer-term solutions. Another way to address this is to set minimum levels of GHG emissions reductions (relative to fossil fuels displaced) for any eligible biofuels. To tighten the guardrails even more, these standards could become more stringent over time.
7. Capping the percentage of credits from biofuels and/or constraining the applications for which biofuels can be used. There are potential benefits to including energy sources such as biofuels, including RNG, in a CHS. These include: (1) that they may be needed for certain, specific hard-to-decarbonize purposes and industrial processes, (2) to help to achieve nearer term emissions reductions, and (3) that by assisting in achieving nearer

⁹⁵ S.5. “An act relating to affordably meeting the mandated greenhouse gas reductions from the thermal sector through efficiency, weatherization measures, electrification, and decarbonization.” As passed by House and Senate. Unofficial version. P. 26. Lines 6 – 13. <https://legislature.vermont.gov/Documents/2024/Docs/BILLS/S-0005/S-0005%20As%20Passed%20by%20Both%20House%20and%20Senate%20Unofficial.pdf>

term reductions, existing fossil fuel energy providers may experience a smoother transition away from only selling fossil fuels. Assisting fuel energy companies with this transition will, hopefully, reduce the degree of stranded utility assets, help protect American consumers and captive ratepayers, and also spur a new, clean energy economy.⁹⁶ However, there are reasons to consider capping or constraining the use of biofuels, particularly RNG which is going to be a relatively scarce (and expensive) resource⁹⁷ and may be important to reserve for addressing the needs of particularly hard-to-decarbonize activities (e.g., specific industrial processes and heavy transportation, rather than using them in the building sector which is easier to decarbonize).

Clearly, selection and definition of guardrails should be carefully considered. Of the six items listed above, the first four are critically important and should be considered non-negotiable. The last two can be useful tools, particularly if any of the first four items are not included in a CHS. These can also be important if there are reasons to believe obligated parties may be biased in favor of biofuels (even when these are not the most economic options in the long run), and that regulators will allow this bias to continue investment in biofuels. Additionally, a CHS can be structured such that the last two items would be implemented, but not immediately – perhaps starting in 2030 or 2035. This would allow an “all of the above” approach to meeting challenging near-term emission reduction goals, including difficult “ramp ups” of efforts, but then ensure that future investments focus only on measures that more significantly reduce emissions.

While there are six mentioned above, overlapping different guardrails can result in exponentially increasing guardrail stringency. For example, establishing a maximum lifecycle carbon intensity score for a biofuel and choosing to ratchet this score down over time (#5) in combination with capping the percentage of credits that can come from biofuels (#6), can have a far greater overall impact than #5 or #6 deployed in isolation. Ultimately, policy designers should carefully assess how guardrails interplay and overlap to ensure the intended outcome is achieved.

⁹⁶ It is also critical to acknowledge that it is our fellow Americans who comprise fuel energy companies; simply shutting companies down means hurting workers who are our friends, family and neighbors, creating a negative ripple effect throughout communities, economies and society writ large.

⁹⁷ See footnote 52 for more information.

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“Should biomass be an eligible measure?”

The role of wood in clean energy policy is another area of robust debate. In many places (Europe and various states like Vermont), it is considered a renewable resource. However, it can result in harmful consequences. For the jurisdictions that have determined wood to be a renewable resource, there are usually requirements around sustainable harvesting practices and allowable technologies, as well as ongoing monitoring of air quality. As has been identified elsewhere, jurisdictions will likely shape a CHS to incorporate – to a degree – existing jurisdictional policies and politics. We discuss the role of biomass in more depth below, in the Vermont section of “Field Applications.”

“Should switching from one fossil fuel to a lower-GHG fossil fuel be an allowable CHS measure?”

Technically, any activity that results in a reduction in emissions could be eligible as a CHS measure. Thus, it can be expected that arguments will be made to make switching from one fossil fuel to a lower-GHG fossil fuel an allowable measure. However, this is not recommended. First, the short-term emissions reductions that occur due to shifting from, say, fuel oil #2 to fossil gas, is ultimately an example of throwing “good money after bad”; it results in deferring investment in longer-term cost and energy savings choices, thereby increasing costs for customers in the long run. Note that this investment results in ongoing costs for both the individual customer (in their building) as well as in the overarching gas system, which results in ongoing costs to all ratepayers. Second, this can result in “locking in” customers to fuel choices and technologies for 15+ years, reducing their flexibility to adjust to future changes in energy costs.

“Should all energy efficiency measures, including efficient fossil fuel burning equipment, be eligible CHS measures?”

Again, technically, any activity that results in a reduction in emissions could be eligible as a CHS measure. However, for all of the reasons mentioned directly above, this is not recommended. Ultimately, purchases of more efficient fossil fuel burning equipment will likely continue to occur in the market, as it can be an economically rational decision in many locations. However, it should not receive any CHS credits.

“Should electrification and other measures be limited to those that are most efficient and therefore provide the greatest emission reductions?”

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We do not recommend setting a threshold level percentage of improvement for either weatherization or electrification in a CHS.⁹⁸ There are a number of reasons for this recommendation. First, weatherization projects typically result in only 15%-25% savings.⁹⁹ 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 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) as compared to switching to inefficient electric measures (e.g., an electric resistance water heater) – even if there is a difference in the near-term.¹⁰⁰ 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 of fixed monthly gas bill charges. In summary, we recommend that other policies focused on efficiency and electricity drive improvements in weatherization and electrification measures, while the CHS be focused on reducing thermal emissions resulting from fossil fuel heat.

⁹⁸ This is not to say that we are supportive of inefficient equipment. For example, we recommend that cold climate air source heat pumps (rather than conventional heat pumps) be installed in colder regions. However, we recommend relying on other state policies to address these emissions, namely electric RPS and clean peak standards for electric grid emissions and energy efficiency requirements for weatherization and electric equipment.

⁹⁹ 2019 Annual Report on Vermont's Progress Toward Building Energy Fitness Goals. Prepared by the Vermont Department of Public Service. Keith Levenson, Energy Program Specialist. Vermont Public Utility Commission Case #EEU 2013-03. December 29, 2020. Blasnik, M., et al. (September 2014). National Weatherization Assistance Program Impact Evaluation: Energy Impacts for Single Family Homes. Oak Ridge National Laboratory report ORNL/TM-2015/13.

https://weatherization.ornl.gov/wpcontent/uploads/pdf/WAPRetroEvalFinalReports/ORNL_TM-2015_13.pdf. Nadel, S., & Fadali, L. (July 2022). Analysis of Electric and Gas Decarbonization Options for Homes and Apartments. American Council for an Energy Efficient Economy Report. <https://www.aceee.org/research-report/b2205>

¹⁰⁰ We do recognize the concern that inefficient equipment and poorly weatherized buildings can significantly increase winter peak demand; however, energy efficiency programs should address this first and foremost.

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“Should ‘certified gas’ be an eligible CHS measure?”

Buying “certified” natural gas (CNG) should not be an eligible measure for a number of reasons. As discussed earlier, for most jurisdictions considering a CHS, the reason for doing so is to achieve emissions reductions from within the jurisdiction. For many of these jurisdictions, any potential emissions reductions resulting from CNG is likely to be outside of the jurisdictional border. Additionally, many of these jurisdictions are considering a CHS to reduce thermal sector emissions occurring in buildings and resulting from various commercial/industrial (C&I) processes. Whether or not CNG achieves reductions in buildings and C&I processes remains debatable. Furthermore, it is likely that the gas extraction and processing sector will experience increasing requirements to achieve emissions reductions, and will likely need to retain reductions rather than sell them to others.¹⁰¹ Finally, there is still considerable uncertainty as to how much emissions are actually reduced via the CNG process; evaluation, verification and measurement (EMV) of reductions results remain highly variable. This translates to the potential for a state to not meet its required emissions reductions, if/when CNG does not actually deliver the promised and expected reductions.¹⁰²

“Should emissions offsets be an eligible CHS measure?”

Emissions offsets should not be an eligible CHS measure. The primary reason for this is that they do not result in emissions reductions in buildings and various C&I processes. Thus, they are unlikely to satisfy legal and/or regulatory requirements. Note that some of the concerns raised about RNG (e.g., whether the presumed reduction occurs inside/outside the jurisdiction, whether it may be needed by the farming/land use sectors, etc.), may or may not apply to offsets. However, the concern regarding accountability and verification certainly applies. It is far easier to count and verify thousands of weatherization projects within a CHS jurisdiction than to ensure that, say, the planting of thousands of trees is real, will remain, and is not being counted by another entity.

¹⁰¹ Examples of increasing requirements include the EPA’s expansion of its 2021 methane rule that requires drillers to identify and seal leaks at all well sites across the country, and the Inflation Reduction Act’s tax on energy producers that exceed a certain level of methane emissions. <https://www.cnbc.com/2022/11/29/biden-rule-to-limit-methane-leaks-flaring-from-public-lands-drilling.html>

¹⁰² The use of CNG also means that the long-term energy and bill savings achieved by customers would not be realized, as they would continue to “lock in” to existing conventional fuels.

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“Should hydrogen be an eligible CHS measure?”

According to testimony of Ilissa Ocko to the State of New York Public Service Commission on behalf of EDF in September 2023,¹⁰³ “there are several climate risks associated with using hydrogen as a clean fuel” of which we should be wary. The testimony states that, “although hydrogen use does not emit carbon dioxide into the atmosphere, hydrogen itself is an indirect GHG and will cause warming when emitted into the atmosphere.” And, in particular, “hydrogen systems can impact the climate depending on how the hydrogen is made, managed, and produced.”

A 2022 study by EDF scientists reinforces the concern over the climate impacts of hydrogen, stating that, “a growing body of research has affirmed that the warming effects from hydrogen emissions are consequential, with new work showing that hydrogen’s indirect warming effects are twice as high as previously recognized.”¹⁰⁴ The study evaluates the climate impacts of deploying hydrogen across various timescales. The results of the study indicate that “hydrogen emissions can considerably undermine the climate benefits of decarbonization strategies that involve clean hydrogen – especially in the decades immediately following deployment.”¹⁰⁵

There are multiple forms of hydrogen, as shown in Figure 3. Of these various forms, we do not recommend allowing for any type besides green hydrogen to be an eligible measure within a CHS. Furthermore, we recommend that the use of green hydrogen be prioritized for use as a substitute for fossil gas for high-heat industrial applications only. While there may be unique circumstances in which green hydrogen is needed to address specific energy requirements, the expected costs associated with this fuel type and technology argue that its application be highly specific and infrequent.¹⁰⁶

¹⁰³ Direct testimony of Ilissa Ocko on behalf of Environmental Defense Fund, September 1, 2023, State of New York Public Service Commission.

¹⁰⁴ Ocko, Ilissa B. and Steven P. Hamburg (2022). “Climate consequences of hydrogen emissions,” *Atmos. Chem. Phys.*, 22, 9349–9368. <https://doi.org/10.5194/acp-22-9349-2022>.

¹⁰⁵ Ocko, Ilissa B. and Steven P. Hamburg (2022). “Climate consequences of hydrogen emissions,” *Atmos. Chem. Phys.*, 22, 9349–9368. <https://doi.org/10.5194/acp-22-9349-2022>.

¹⁰⁶ The authors recognize that hydrogen blending has been identified by multiple gas utilities as a means to decarbonize. Technically, hydrogen blending could assist in reducing emissions. However, this activity should not be creditable within a CHS. The rationale for this is that the potential emission reduction benefits are just not substantial enough to warrant a focus on this measure. At most, ~6% hydrogen blending by energy content

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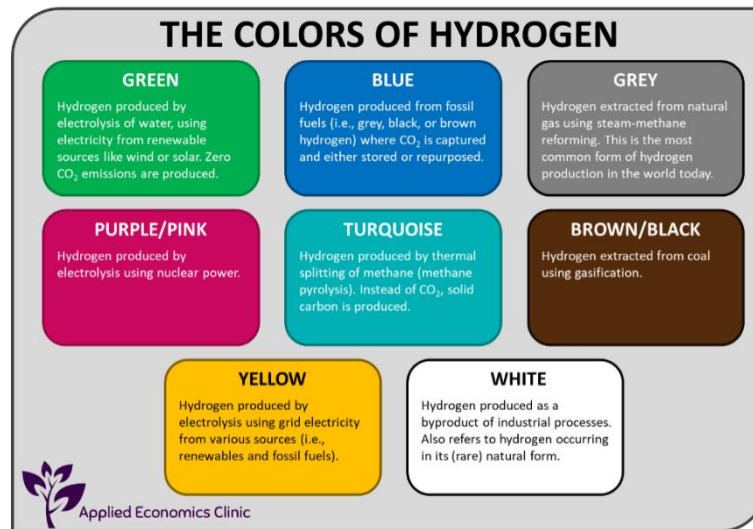


Figure 3. The Colors of Hydrogen.¹⁰⁷

Summary of Eligible Activities and Measures

There are many actions that may reduce emissions. However, as described above, some of these options are not recommended to be eligible CH measures. The following should **not** be included in a CHS:

- Certified natural gas
- Carbon offsets
- Fuel switching from one fossil fuel to another
- Efficient fossil fuel burning equipment
- Hydrogen blending.

(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. This minimal impact, combined with the cost of integrating hydrogen into the existing gas grid and potential lack of compatibility with building equipment, argues against making green hydrogen eligible except when directly applied to high-heat industrial applications. Ultimately, it will be critically important for regulators to insist on both the lowest cost and least risk solutions to protect ratepayers in order to ensure that hydrogen blending does not become a significant focus of gas decarbonization plans.

¹⁰⁷ Castigliano, J. and Stasio, T. "The 'Colors' of Hydrogen." June 6, 2021. <https://aeclinic.org/aec-blog/2021/6/24/the-colors-of-hydrogen>

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Other potential measures can result in significant unintended consequences if not implemented in a clear manner with strict guardrails and ongoing verification and evaluation. Harmful consequences can include ongoing (and even more concerning, new) emissions, air and water quality impacts, unsustainable land use practices, environmental injustices, and public health implications (e.g., as a result of air pollution). However, there may be specific applications (such as high-heat industrial processes) or reasons (such as achieving near-term emissions reduction requirements) that warrant inclusion of these options in a CHS.

The following measures should **only be eligible within strict guardrails**:

- Low-carbon district heating
- Advanced wood heating¹⁰⁸
- Certain biofuels, including RNG
- Hydrogen.

Recommendations

Eligible activities for clean heat measures may include:

- Weatherization and other building improvements (as standalone activities, and also as part of a larger retrofit project)¹⁰⁹
- Heat pumps and heat pump water heaters¹¹⁰
- Solar thermal
- No carbon district heating
- Low carbon district heating (within guardrails)
- Advanced wood heating (within guardrails)
- Certain biofuels, including RNG, with essential guardrails such as:

¹⁰⁸ Advanced wood heat can be defined as bulk pellet and woodchip fueled boilers and furnaces. These systems burn more efficiently and cleanly than cord-wood stoves.

¹⁰⁹ The authors recognize that the emissions associated with various efficiency measures such as sprayfoam are real and concerning. However, we recommend that, rather than estimate and apply these emissions to the technology within the design of the CHS, there be coordination with other policies and research and development initiatives already underway to reduce these particular emissions.

<https://www.epa.gov/greenerproducts/identifying-greener-insulation>

¹¹⁰ The authors note that heat pumps can create significant emissions when refrigerants leak. Similar to the above footnote, we recommend that to address these emissions, there be coordination with other policies and research and development initiatives already underway to reduce these particular emissions. For example, the Environmental Protection Act proposed rules in October of 2023 to address hydrofluorocarbons.

<https://www.epa.gov/climate-hfcs-reduction/management-certain-hydrofluorocarbons-and-substitutes-under-subsection-h>

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- Requiring a lifecycle accounting of GHG emissions
- Requiring a contractual pathway for delivery of RNG
- Limiting credit eligibility to only existing RNG sources
- Precluding biofuels from receiving CHS credits if they are shown to create other environmental and/or social harms

Depending on adoption of the guardrails above, the pace or timing of state emission reduction requirements, and other local factors, the following additional biofuel guardrails could be considered:

- Establishing maximum lifecycle carbon intensity scores for biofuels
- Capping the percentage of credits from or constraining applications of biofuels, including RNG.
- Green hydrogen (within guardrails).

Field Applications

As mentioned in Section 3, Colorado’s statute defines clean heat resources as any one or a combination of:

1. Gas demand-side management programs
2. Recovered methane, which means any of the following that are located in Colorado and meet a recovered methane protocol approved by the air quality control commission:
 - a. Biomethane
 - b. Methane derived from
 - i. Municipal solid waste
 - ii. The pyrolysis of municipal solid waste
 - iii. Biomass pyrolysis or enzymatic biomass
 - iv. Wastewater treatment.
 - c. Coal mine methane, as defined in section 40-2-124(1)(a)(II), the capture of which is not otherwise required by state or federal law
 - d. Methane that would have leaked without repairs of the gas distribution and service pipelines from the city gate to customer end use.
3. Green hydrogen
4. Beneficial electrification
5. Pyrolysis of tires if the pyrolysis meets a recovered methane protocol
6. “Any technology that the commission finds is cost-effective and that the division finds results in a reduction in carbon emissions from the combustion of gas in customer end

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uses or meets a recovered methane protocol approved by the Air Quality Control Commission.

To avoid “double counting” of emissions reductions, Colorado’s statute mandates that “to qualify as a clean heat resource, all credits¹¹¹ or severable, tradable mechanisms representing the emission reduction attributes of the clean heat resource must be retired in the year generated and may not be sold.”¹¹² With regards to placing “guardrails” around the use of biofuels, Colorado’s legislators did limit this resource to 1% of the total 4% reductions required by 2025, and 5% of the total 22% reductions required by 2030.

As mentioned previously, only one Clean Heat Plan has been filed thus far, and it has since been withdrawn with an amended plan due in early 2024. The original, preferred plan presented in the initial filing is presented below, in Table 3.

Table 3. JWI-D-3: Overview of Public Service Companies preferred “Clean Heat Plus” portfolio.¹¹³

Emission Reduction Category	Cumulative Emission Reductions 2024 – 2028 (MTs)	Cumulative Program Cost 2024 - 2028 \$M	Role in Portfolio
Planned DSM	232,633	N/A	Supporting
Efficiency	152,292	\$ 81	Clean Heat Resource
Electrification	453,436	\$303	
LDC Methane Abatement	-	\$-	
Hydrogen	53,723	\$26	
RNG/Recovered Methane	256,438	\$362	Additional Measures
CNG	329,147	\$13	
Offsets	365,000	\$31	
Clean Heat Plus Total	1,610,035	\$816	

Summarizing the above information, offsets and CNG equate to 38% of PSCo’s proposed emissions reductions, with RNG/recovered methane equaling 14%. Efficiency and electrification total 33% of proposed emissions reductions, with gas DSM totaling 13% and hydrogen blending providing 3%. As discussed earlier, multiple stakeholders argued that offsets and CNG are not

¹¹¹ In this instance, the use of the term “credit” references compliance markets such as the U.S. Environmental Protection Agency’s Renewable Fuel Standard. For more information, visit: <https://www.epa.gov/renewable-fuel-standard-program>

¹¹² §40-3.2-108. (2)(c) and (2)(n), C.R.S.

¹¹³ Proceeding No. 23M-0234G. <https://puc.colorado.gov> and https://www.dora.state.co.us/pls/efi/EFI_Search_UI.search_H'rg_Ex_101_at_48:1.

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eligible resources, with PSCo ultimately requesting additional time to file a new, amended application.

If PSCO's withdrawal of their preferred plan is an indication of how Colorado's CHS may ultimately look, then it appears as though some of the above recommendations (e.g., not including CNG and offsets as eligible resources) may apply in Colorado. However, other measures, such as replacing less efficient fossil fuel burning equipment with more efficient systems, may be eligible. Current gas DSM programs in Colorado do provide incentives to shift from one fossil fuel system to another, less emitting system. Because much of Colorado's CHS statute is high level, determining which measures/fuels/activities are eligible or not will likely take time, since it appears the decision-making process will occur within the PUC review and approval process of utility-filed CH plans.

In at least some ways, the Vermont statute is more specific and clear about what emission-reducing measures can and cannot count as clean heat measures. For example, it clearly states that "other emissions offsets, wherever located, shall not be eligible measures"¹¹⁴ and that "clean heat measures shall not include switching from one fossil fuel use to another fossil fuel use."¹¹⁵ Vermont's policy also articulates that "eligible clean heat measures delivered to or installed in residential, commercial, and industrial buildings in Vermont shall include:

1. *Thermal energy efficiency improvements and weatherization*
2. *Cold-climate air, ground source, and other heat pumps, including district, network, grid, microgrid, and building geothermal systems*
3. *Heat pump water heaters*
4. *Utility-controlled electric water heaters*
5. *Solar hot water systems*
6. *Electric appliances providing thermal end uses'*
7. *Advanced wood heating*
8. *Non-combustion or renewable energy-based district heating services;*
9. *The supply of sustainably sourced biofuels*
10. *The supply of green hydrogen*
11. *The replacement of a manufactured home with a high efficiency manufactured home and weatherization or other efficiency or electrification measures in manufactured homes*

¹¹⁴ 30 V.S.A. Chapter 94. §8127.(j).

¹¹⁵ 30 V.S.A. Chapter 94. §8123.(3).

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12. Line extensions that connect facilities with thermal loads to the grid.”¹¹⁶

For RNG, the Vermont statute makes clear that “for pipeline renewable natural gas and other renewable generated natural gas substitutes to be eligible, an obligated party shall purchase renewable natural gas and its associated renewable attributes and demonstrated that it has secured a contractual pathway for the physical delivery of the gas from the point of injection into the pipeline to the obligated party’s delivery system.”¹¹⁷ Additionally, for any biofuel to be eligible as a clean heat measure, “a liquid or gaseous clean heat measure shall have a carbon intensity value as follows:¹¹⁸

1. Below 80 in 2025
2. Below 60 in 2030
3. Below 20 in 2050, “provided the Commission may allow liquid and gaseous clean heat measures with a carbon intensity value greater than 20 if excluding them would be impracticable based on the characteristics of Vermont’s buildings, the workforce available in Vermont to deliver lower carbon intensity clean heat measures, cost, or the effective administration of the Clean Heat Standard.”¹¹⁹

Vermont also includes other guardrails. One such example is the requirement that the PUC “biennially assess harmful consequences that may arise in Vermont or elsewhere from the implementation of specific types of clean heat measures and shall set standards or limits to prevent those consequences. Such consequences shall include environmental burdens as defined in 3 V.S.A. §6002, public health, deforestation or forest degradation, conversion of grasslands, increased emission of criteria pollutants, damage to watersheds, or the creation of new methane to meet fuel demand.”¹²⁰

Thus, Vermont does deploy several of the “guardrails” recommended above. However, there are many who criticize Vermont policy because it determines that “advanced wood heat” is an eligible resource and includes “noncombustion or renewable energy-based district heating

¹¹⁶ 30 V.S.A. Chapter 94. §8127(d). Note that measures 11 and 12 were purposeful, “Vermont-specific” inclusions to address general affordability concerns as well as concerns raised by maple sugar producers. Developing state-specific examples like these can assist in negotiations towards final CHS adoption.

¹¹⁷ 30 V.S.A. Chapter 94. §8127 (e).

¹¹⁸ These values are relative to No. 2 fuel oil delivered into or in Vermont having a carbon intensity value of 100.

¹¹⁹ 30 V.S.A. Chapter 94. §8127(f).

¹²⁰ 30 V.S.A. Chapter 94 §8127(h).

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services” (measure 8, above). The latter inclusion opens the door for an existing wood-fueled electricity generator to potentially comply with the CHS in the event that the plant is expanded to provide district heat.¹²¹

Both Colorado and Vermont’s statutes are relatively thin with regards to the role hydrogen may play. However, because green hydrogen may be needed to address energy-intensive industrial processes (on-site), and because gas utilities want this opportunity, it is included in statute. Unfortunately, there are relatively few guardrails pertaining to the use of hydrogen in both Colorado and Vermont statute. This may be due to the fact that there are few actual projects that have been permitted and built thus far, thereby lulling policy makers in skimming over policy details. With gas utilities and the federal government leaning heavily into potential hydrogen applications, policy makers and stakeholders should waste no time in assessing the potential role of hydrogen within a CHS, including articulating specific guardrails for its use.

Massachusetts’ current proposal – based off the November 2023 draft framework – is focused on implementing a program that is relatively simple and clear, one that can be launched swiftly and promptly. This approach is marked by including relatively few creditable activities and reduced granularity regarding emissions accounting than what is being considered in, say, Vermont. For example, the authors’ read of the draft framework is that only space heating electrification and certain liquid biofuels would be eligible to earn clean heat emission reduction credits. “To avoid unnecessary complexity and redundancy with the Mass Save program, weatherization and energy efficiency measures would not be eligible to earn CHCs.”¹²²

There are a number of concerns with this approach. Of course, there are concerns about using energy as efficiently as possible, customer comfort and potential cost if/when heat pumps are installed in inefficient homes. However, another key concern is that gas utilities will be very challenged to meet emission reduction goals. For example, as shown below in Table 4 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 (this

¹²¹ The McNeil plant, based in Burlington, was commissioned in 1984. At the time, the use of wood fuel for electricity generation was considered a step forward from the plant it was replacing, the coal-fired Moran plant, decommissioned in 1986. There is one other existing wood-fueled electricity-generating plant in Vermont.

¹²² MassDEP Clean Heat Standard (CHS) Draft Framework for Stakeholder Comment Only. November 2023. P. 5. <https://www.mass.gov/doc/chs-draft-program-framework>

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is discussed further in Section 4.6.2 below), resulting in a total of 3,925 MTs of cumulative annual emissions reductions by 2030.¹²³ Thus, the residential electrification obligation would only account for 31% of the 12,500 MT of the emission reductions the seller would also be obligated to produce. With emission reductions from weatherization, other forms of residential electrification (e.g., water heaters), and gaseous biofuels (RNG) 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). This does not appear to be feasible or realistic.

Table 4. Sample requirements for Massachusetts fuel seller.¹²⁴

	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%		

In Massachusetts, the use of liquid biofuels is a creditable action (hydrogen is not). As mentioned in Section 4.4, the November 2023 draft framework does not require lifecycle accounting at the outset of the program but mentions that further considerations are suggested during the 2028 program review. However, it is unclear what exactly will be eligible for review and consideration regarding biofuels, during the 2028 process. These issues, and others, were raised as part of stakeholder comments in response to the draft framework. Interestingly, the previous stakeholder discussion document by MassDEP – released in March 2023 - highlights that the CECP for 2025 and 2030:

also includes repeated references to the importance of crediting weatherization. Other potential options for replacing fossil fuels may have significant enough disadvantages to warrant exclusion, such as current-generation crop-based biofuels (which have significant and highly uncertain indirect land use and emission impacts), electric

¹²³ Based on DEP’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.

¹²⁴ MassDEP Stakeholder Discussion Document. Clean Heat Standard Program Design. March 2023. P. 4. <https://www.mass.gov/doc/clean-heat-standard-discussion-document/download>

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*resistance heating (which is much less efficient than heat pump technology), reductions that occur in un-weatherized homes (also inefficient), and combined heat and power systems that rely on fossil fuels.*¹²⁵

Ultimately, it remains to be seen how MassDEP will move forward.

The two publicly available presentations discussing a potential CHS in Maryland indicate that many of the above issues are being discussed and considered. For example, the following issues are mentioned: whether biofuels (including RNG) and woody biomass are to be eligible, and if yes, whether there should be limits placed on these; that there should be no credits available from activities occurring out of state (for example, using offsets); and whether there should be limits to fossil-to-fossil switching and/or whether more efficient fossil heating equipment can be eligible.¹²⁶

As quoted earlier, the December 2023 Climate Plan states that “Anything that reduces emissions from buildings helps the obligated parties meet the CHS requirements, so as customers take advantage of federal, state, and EmPOWER incentives for energy efficiency and electrification upgrades or take any other actions to reduce emissions from buildings, the customers’ actions help the obligated parties achieve their requirements.”¹²⁷ The Plan also suggests that there may be some guardrails around the application of biofuels: “While ZEHES, electrification incentives, and other policies will transition almost all of Maryland’s fuel-burning buildings to be all-electric by 2045, CHS layers on top of these policies to increase the pace of building sector decarbonization while improving shells and transitioning the last bit of fuel demand to lower-impact fuels, ***especially for high-heat applications.***”¹²⁸

¹²⁵ Ibid. P. 6.

¹²⁶ See meeting materials from February 16 and August 20, 2023, available at:

<https://mde.maryland.gov/programs/air/ClimateChange/MCCC/Pages/MWG.aspx>

¹²⁷ Maryland’s Climate Pollution Reduction Plan: Policies to Reduce Statewide Greenhouse Gas Emissions 60% by 2031 and Create a Path to Net-Zero by 2045. December 28, 2023. P. 40.

<https://mde.maryland.gov/programs/air/ClimateChange/Maryland%20Climate%20Reduction%20Plan/Maryland%27s%20Climate%20Pollution%20Reduction%20Plan%20-%20Final%20-%20Dec%2028%202023.pdf>

¹²⁸ Ibid. Bold italics those of the author.

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4.6 Specific questions pertaining to credit-based CHS

4.6.1 Determining the ways in which credits can be acquired

As mentioned earlier, a benefit to a CHS in which multiple market actors participate by generating and trading credits, is that it allows multiple pathways to compliance. This flexibility should assist in minimizing costs and ensuring that the standard is met, as obligated parties will have different approaches to acquiring credits. As presented below, Neme and Cowart describe at least five ways to acquire credits in the Vermont context. Vermont has three energy efficiency utilities, including Efficiency Vermont which provides statewide services. Other jurisdictions with similar efficiency program structures may consider deploying the same five options.

Options one to three can be considered to be standard, in that they should always be available to obligated parties. Options four and five may not always be implemented, as they offer both benefits and drawbacks. Option four, purchasing credits from the open market, can be beneficial as it has the potential to increase innovation and reduce costs. By enlarging the playing field for who and how credits are created, option four can also reduce the level of market control that individual gas utilities may have in determining the mix of implemented measures. Option five, developing and utilizing a DDA, can be helpful in jurisdictions where there are many smaller obligated parties. This may include delivered fuel providers and/or smaller gas utilities (e.g., municipal gas utilities). However, both of these options come with added administrative complexity, requiring regulators to develop and oversee additional mechanisms within a new credit-trading market.

1. *Obligated parties should have the option to **generate credits directly**, by helping customers to install different emission reduction measures (e.g., heat pumps, wood pellet stoves, and weatherization of buildings) and/or by purchasing and selling biofuels to customers, as this is the simplest way for them to comply with the Clean Heat Standard. This is analogous to how efficiency and renewable energy credits are acquired in Vermont today.*
2. *If an obligated party does not want to work with customers directly, it could **hire contractors to install** clean heat measures on their behalf. This is also analogous to how many utility efficiency programs operate in Vermont and across the country.*
3. *Third, an obligated party could hire a more broad-based **third-party program administrator**, who might earn credits through a range of services, and might deliver them on behalf of multiple obligated parties. This is analogous to the way that Efficiency Vermont works today on behalf of multiple electric utilities.*

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4. As a fourth option, the obligated party could **buy credits on the open market**, which allows a variety of private sector businesses to use the Clean Heat Standard as a vehicle to advance existing or new business models. For example, a current fuel oil dealer or an HVAC contractor could decide to diversify its business by selling heat pumps or wood pellet stoves, generating credits that could then be sold to any obligated party. When an obliged party buys those credits, it would defray the cost of making heat pump and/or pellet stove sales, ultimately lowering costs to customers and/or increasing the profitability of the business selling the clean heat products.
5. The final option would be assigning emission reduction obligations to a **“default delivery agent”** designated by the PUC. This could be an “option of last resort,” providing an “out” for any obligated party that does not want to have to deal with the planning and management of efforts to acquire credits in some other way.

** If other states were to create a Clean Heat Standard equivalent to Vermont’s, it’s possible to envision a multi-state market for Clean Heat credits. Vermont has experience in some of these markets, including the Regional Greenhouse Gas Initiative, the regional market for renewable credits, and credit trading under the Clean Air Act. However, we conclude that it is unnecessary and would be unwise for Vermont to wait for other states to act before launching our own Clean Heat program. Many of the benefits of clean heat, including air quality, health, lower fossil fuel bills, and economic development benefits, are local, and the program is aimed at improving the Vermont building stock. There is no reason to wait for other states to act before delivering these benefits in Vermont.”¹²⁹*

In keeping with the outcome of the above recommendations, and similar to many RPS, it doesn’t necessarily matter who generates a CHS credit. What matters is that the obligated parties can show they have met their obligation and emissions are dropping. This opens the door for many more market actors to create credits, thereby increasing the likelihood of CHS compliance (as an obligated party that may have too few credits can purchase credits from an entity that generates them, but does not need them) and further spurring market activity. An example of this flexibility is a weatherization contractor who completes a project and then sells those savings to an obligated entity.

¹²⁹ Cowart, R., Neme, C. “The Clean Heat Standard.” An Energy Action Network White Paper. December 2021. P. 31.

Recommendations

Obligated parties should have flexibility in how they choose to acquire credits, including:

- Self-generating credits
- Contracting with others to generate credits
- Utilizing a third-party energy program administrator to oversee and deliver clean heat credits.

*Note that attribution of credits is not required.

Depending on the size and number of obligated parties, as well as the capacity and interest for state infrastructure to design and oversee a new market, the following two options may also be considered:

- Purchasing credits on an open market
- Assigning their obligation to a “default delivery agent.”

Field Applications

Colorado’s statute does not include language pertaining to the generation of credits and the potential for credit trading. From the one plan filed thus far (and recognizing that that plan is being amended), it appears as though many of the measures and reductions may – at this time – be undertaken by the obligated party itself. However, this is conjecture based on currently available resources. For example, some measures could be completed “in house” or through direct agreements with other entities or via a competitive bid process. Or, as more utilities file plans, there could be proposals to have them work collaboratively to reduce costs in achieving reductions. Alternatively, the PUC could require utilities to invest in reduction measures that other entities are generating (e.g., private weatherization businesses or heat pump installers), if those other measures achieve greater emissions reductions at lower cost than what the utility proposes. With CHS being new to the policy arena, many of these details remain in flux.

Vermont statute allows for all five recommended approaches. The role of a potential DDA remains to be seen. The purpose of a DDA is to provide an easier path towards compliance for smaller obligated parties. However, during testimony and in some of the earliest regulatory filings, the Vermont Fuel Dealers Association (VFDA) has stated that the need for and presence of a DDA should not be assumed; rather, VFDA has actively argued that many fuel dealers may wish to self-generate credits. This may result in slightly less consistency across the market in

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Vermont, as different companies may offer different options to their customers. However, for many policy makers, the intent behind the CHS was to transform the thermal energy market by motivating energy providers to utilize their customer relations to transition to alternative energy services besides selling fuel and installing furnaces and boilers. Thus, if there is some market inconsistency but generally customers are shifting towards cleaner heat options at the pace needed and at an affordable price, then policy makers could consider the VT CHS to be successful.

Massachusetts and Maryland materials both indicate that there is consideration of the potential to sell credits associated with clean heat measures. MassDEP's November 2023 draft framework states that "regulated energy suppliers would obtain CHCs by implementing clean heat themselves or purchasing credits from third parties, such as heat pump installers."¹³⁰ This most recent framework does not mention a potential DDA. Similarly, Maryland's December Climate Plan states that "obligated parties can also work with third parties to deploy a range of clean heat measures that reduce emissions."¹³¹

4.6.2 Setting the value of credits

Previous sections have already addressed various questions associated with how/where to set the value of credits. For example:

- Section 4.3 addresses the question: *Should emissions from the electric grid be "netted out" when assigning emission reduction values to electrification measures?*
 - We recommended that emissions from the electric grid not be included in the CHS values, because these are generally being captured by other policies such as RPS.
- Section 4.4 addresses the question: *Should emission reduction values be based on "burner-tip" emission reductions or lifecycle emission reductions?*
 - We recommend that emission reduction values be measured at the site level (or "burner-tip") except for biofuels, which should be calculated by netting out the CO₂e savings from the full lifecycle emissions of the biofuel.

¹³⁰ MassDEP Clean Heat Standard (CHS) Draft Framework for Stakeholder Comment Only. November 2023. P. 4. <https://www.mass.gov/doc/chs-draft-program-framework>

¹³¹ Maryland's Climate Pollution Reduction Plan: Policies to Reduce Statewide Greenhouse Gas Emissions 60% by 2031 and Create a Path to Net-Zero by 2045. December 28, 2023. P. 40. <https://mde.maryland.gov/programs/air/ClimateChange/Maryland%20Climate%20Reduction%20Plan/Maryland%27s%20Climate%20Pollution%20Reduction%20Plan%20-%20Final%20-%20Dec%2028%202023.pdf>

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Remaining
question:

- *By what process will emission reduction credit values be established for different eligible clean heat measures?*

“By what process will emission reduction credit values be established for different eligible clean heat measures?”

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 by many state energy efficiency programs. 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. This is, again, similar to how various state Energy Efficiency Technical Reference Manuals establish deemed savings values for common measures promoted through mass market channels. These 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 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.

Additional recommendations regarding establishing credit values for eligible measures are provided by Cowart and Neme verbatim, as follows (note that #2 and #4 have been addressed previously):

- 1. A technical advisory group (TAG) should be charged with developing deemed assumptions regarding the credits that common clean heat measures produce.** That would include the number of credits a measure is worth each year, the life of the measure (i.e., the number of years for which it would earn credits), any degradation in credit values over time, and other relevant assumptions.
- 2. Credits for biofuels will be based on the “but for” principle – i.e., what emissions would have occurred absent use of the biofuel to displace a fossil fuel in Vermont.**

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This will require consideration of deliverability (see above) and all regulations, including GHG regulations, applicable to agriculture, forestry, and other relevant sectors in the jurisdiction in which the biofuel is produced.

- 3. Credits will be “time-stamped.”** Measures that produce emissions reductions over multiple years – e.g., heat pumps, other electrification measures, advanced wood heat, and weatherization measures – would earn an appropriate number of credits for the year they are installed as well as each subsequent year during which they would be expected to produce emission reductions. Only the credits with the current year “time-stamp” would apply to the current year obligation; credits with future year time-stamps would apply against credit requirements in those future years.
- 4. TAG assumptions will be updated annually.** The update process will include formal approval by the PUC and will be concluded in the Fall of each year so that obligated parties can have sufficient notice of changes in assumptions to adjust their plans for meeting their obligations the following year.
- 5. Once approved, TAG assumptions will be “locked” for the year in question, and will not be changed with retroactive effect.** Credits earned by any measure installed during that year – including credits for future years associated with long-lived measures – will not be changed.
- 6. Credits for uncommon measures not addressed by the TAG process, as well as for measures installed in large businesses for which the cost of site-specific estimates of impacts can be justified, will be estimated by obligated parties on a custom basis.** Such estimates will be subject to review and regulatory approval.”¹³²

Recommendations:

Recommendations repeated from previous sections include:

- Credits should be measured in CO₂e
- Electrification measures should be treated as zero-emitting
- Eligible activities should be measured at the site level except for biofuels, which should be calculated by netting out the CO₂e savings from the full lifecycle emissions of the biofuel.

Additionally:

- A Technical Advisory Group (TAG) should be established to develop deemed savings assumptions for comment measures

¹³² Cowart, R., Neme, C. “The Clean Heat Standard.” An Energy Action Network White Paper. December 2021. P. 28. Copied verbatim.

- Credits should be “time-stamped”
- TAG assumptions should be updated annually
- Assumptions should be “locked” in for the given year, and cannot be changed retroactively
- The deemed savings for infrequent and specialized projects (e.g., for commercial and industrial processes) should be developed via a customized process.

Field Applications

In keeping with comments provided in previous “Field Applications” sections, Colorado’s CHS policy structure does not involve the development of credits nor the same level of detail in defining and characterizing eligible resources. However, there is a process and mechanism through which the value of various clean heat measures and activities is identified. Specifically, the Air Pollution Control Division oversees this methodology,¹³³ following the Code of Colorado Regulations rules 4525 – 4528.¹³⁴

Vermont’s statute reflects many of the recommendations presented above. It establishes a TAG and includes the six recommendations provided above. The Vermont PUC must oversee the overall TAG process, including review and approval of proposed emission analyses and assumptions.

MassDEP’s March 2023 documentation shows regulators proposing a few different options for moving forward:

Once the list of creditable technologies is finalized, the more complex task of assigning the credit value to various creditable actions must be addressed. One model for this...currently being implemented as LCFS requirements for transportation fuels in California and Oregon, is to assign every emission reduction ‘pathway’ a specific credit value, denominated in GHG emission reductions. This approach might be workable because Massachusetts could draw on California’s work and simply ‘adopt’ California’s pathways. However, it might be possible to create a simpler system appropriate for Massachusetts’ focus on electrification; one option would be to establish a simple ‘yardstick’ such as by setting one credit equal to the average amount of emission reductions achieved through full electrification of one single family home (up to 3000

¹³³ <https://cdphe.colorado.gov/aqcc-regulations>

¹³⁴ <https://www.sos.state.co.us/CCR/GenerateRulePdf.do?ruleVersionId=11130>

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square feet). Then each complete home conversion would earn one of these credits toward the emissions reduction standard each year, with other situations, such as biofuel blending, ‘partial’ electrification (where a fossil-fueled back up system is retained), and larger buildings credited on a sliding scale. It might even be possible to establish the entire standard in terms of converted square feet, such that energy suppliers would be required to estimate the amount of conditioned space across their customer base, and the annual standard would be specified as a percentage of this total. A particular advantage of this approach is that it would avoid complications related to the fact that heating emissions vary widely with the weather.

The paragraph concludes with: “Any system will face trade-offs between administrative simplicity and precision.”¹³⁵

The November 2023 draft framework indicates that MassDEP is leaning towards simplicity rather than precision. As mentioned earlier, MassDEP proposed that “emission reduction crediting would be based on the following general principles:

- 1. Substituting clean heat for combustion in a single residence would be credited for an emission reduction of 5 MT per year, regardless of the size of the residence or whether it was an apartment or single-family home.*
- 2. Heat pump systems at residences that do not meet the full electrification standard but are used for heating throughout a residence would be credited for an emission reduction of 2.5 MT per year.*
- 3. Non-residential commercial projects would receive emission reduction credits based on demonstrated implementation of clean heat and emission reductions. Crediting would be consistent with methods used by the Massachusetts Department of Energy Resources (DOER) or MassDEP’s greenhouse gas emissions reporting regulation for facilities.*
- 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.”¹³⁶*

¹³⁵ MassDEP Stakeholder Discussion Document. Clean Heat Standard Program Design. March 2023. P. 6. <https://www.mass.gov/doc/clean-heat-standard-discussion-document/download>

¹³⁶ MassDEP Clean Heat Standard (CHS) Draft Framework for Stakeholder Comment Only. November 2023. P. 5-6. <https://www.mass.gov/doc/chs-draft-program-framework>

Besides the concern discussed earlier regarding the treatment of biofuels, the proposal to provide the same “yardstick” measurement reduction of 5 MT to any full electrification project – regardless of size or whether it was detached or not – raises questions as to the accuracy of the reduction estimate. However, MassDEP does propose review and “truing up” of reductions to assess whether emissions are decreasing on par with state mandates. MassDEP’s rationale to provide the same credit value – regardless of size or type of residence – is to try to ensure that smaller residences are still served. Again, it remains to be seen how MassDEP will ultimately determine credit values.

MDE does not mention setting credit values in the December 2023 Climate Plan.

4.6.3 Credit banking/borrowing

Key questions:

- *Should obligated parties be allowed to “bank” emission reductions in excess of those required in a given year? If yes, should there be any limitations on how such banked reductions can be applied to future year obligations?*
- *Should obligated parties be allowed to “borrow” credits assumed to be created in future years, to address a current-year shortage of credits?*

“Should obligated parties be allowed to “bank” emission reductions in excess of those required in a given year? If yes, should there be any limitations on how such banked reductions can be applied to future year obligations?”

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

ALLOWING SOME BANKING PROVIDES IMPLEMENTATION FLEXIBILITY. HOWEVER, THERE SHOULD BE LIMITATIONS ON THE USE OF BANKED CREDITS TO MAINTAIN A CONSISTENT MARKET SIGNAL AND TO ENSURE REDUCTION TARGETS ARE MET.

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a smaller energy provider has an opportunity to complete a large clean heat project for one or more customers (e.g., a large industrial electrification project or a district heating project). It makes more sense to have both entities complete the project as one, holistic construction process and to allow some portion of excess credits roll forward, than to require both entities to work through the complexity of completing one part of the project in one year and the remainder of the project in a subsequent year. However, cumulative emission reduction goals must still be met if banking is allowed. Additionally, there should be some limitations on the use of banked credits (e.g., 15 – 30% maximum) 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.

“Should obligated parties be allowed to ‘borrow’ credits assumed to be created in future years, to address a current-year shortage of credits?”

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. There are at least three reasons for this. First, borrowing means that a near-term emission reduction target is missed. Second, there is no certainty about whether the obligated party would actually generate enough extra reductions in a future year, to have anything to borrow. Third, setting policy that allows for the borrowing of future credits sets an assumption that non-compliance is acceptable and expected. This not only creates market uncertainty, it fundamentally undermines the CHS.

*BORROWING FUTURE CREDITS
SHOULD NOT BE ALLOWED AS
IT CREATES MARKET
UNCERTAINTY AND
FUNDAMENTALLY
UNDERMINES THE CHS.*

Recommendations:

- Obligated parties may be allowed to bank a limited percentage of credits (e.g., 15 – 30%) per year, but cumulative emission reduction goals must still be met.
- Borrowing of credits should not be allowed.

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Field Applications

Colorado's policy does not explicitly address whether banking is permitted. However, the list of portfolios that a utility must provide to the PUC as part of their filed CHP includes:

- (1) A portfolio of resources that uses clean heat resources to the maximum practicable extent, that complies with the cost cap, that may include leak reductions approved by the commission, and that may or may not meet the clean heat target in the applicable plan period but that demonstrates reductions in methane emissions*
- (2) A portfolio that meets the clean heat targets in the applicable plan period using only clean heat resources but that need not meet the cost cap*
- (3) Other portfolios at the utility's discretion*
- (4) Other portfolios as directed by the Commission.*¹³⁷

The first portfolio opens the door for a utility to present, and the PUC to approve, a structure that “may or may not” meet the clean heat target. To a degree, the end effect of an approved portfolio that does not meet the clean heat target is, essentially, a borrowing of future emissions reductions – only there is no requirement, unless the PUC imposes it, that a future CHP must make up the difference in missed emissions reductions.

In Vermont, banking of credits from over-compliance with emission reductions is allowed. Specifically, “the Commission shall allow an obligated party that has met its annual requirement in a given year to retain clean heat credits in excess of that amount for future sale or application to the obligated party's annual requirements in future compliance periods, as determined by the Commission.”¹³⁸

Vermont's statute also allows for “early action credits.” Early action credits are emission reductions created between January 1, 2023, and the first year that clean heat standard requirements would go into effect (i.e., 2026). Early action credits are an additional form of banking. They provide incentives for obligated parties and others to begin to invest in clean heat measures while the rules for the CHS are being developed and put in place. This should enable a more gradual and less disruptive ramp up of markets for clean heat measures. This policy approach is in keeping with Vermont's Renewable Energy Standard (RES) for the electric

¹³⁷ §40-3.2-108. (4)(c)(II).

¹³⁸ 30 V.S.A. Chapter 94. §8124(e).

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grid, which also allows for banking of credits and also allowed for early action credits when the RES was first enacted.

Vermont statute does not directly allow borrowing of future credits as a means of compliance.¹³⁹

MassDEP's November 2023 draft framework proposes that "banking of full electrification credits for use in future compliance years would be allowed without limit. In combination with the gradual phase in schedule...this would ensure an adequate supply of credits in the early years of the program and support development of a durable and liquid market for credits."¹⁴⁰ Borrowing is not mentioned.

MDE's 2023 Climate Plan does not mention banking or borrowing of credits. However, "A Clean Heat Standard for Maryland" does state that banking of clean heat credits is recommended to meet future obligations, but not borrowing.¹⁴¹

4.7 Setting cost containment mechanisms

Key question:

- *Should a CHS policy include alternative compliance payments, cost caps or other "off-ramps" to address concerns about the costs of compliance? If so, how should they be structured?*

¹³⁹ However, in the event of non-compliance, the PUC may waive the non-compliance penalty (described more in Section 4.8.2) if it finds that the obligated party made a good faith effort to comply, that non-compliance resulted from market factors beyond the obligated party's control, and if the PUC adds the number of deficient credits to future years. This is, in a way, borrowing future credits. However, for the PUC to approve this approach does require some level of effort on behalf of the obligated party in that they must prove that market factors made it impossible to comply. Additionally, if the PUC determines that the obligated party did not truly make a good faith effort to comply, then the obligated party does not receive additional time to comply and they must pay the non-compliance fee. 30 V.S.A. Chapter 94. §8124(f)(3).

¹⁴⁰ MassDEP Clean Heat Standard (CHS) Draft Framework for Stakeholder Comment Only. November 2023. P. 1. <https://www.mass.gov/doc/chs-draft-program-framework>

¹⁴¹ Cowart, R., Seidman, N., LeBel, M., Weston, F. Meeting the Thermal Challenge: A Clean Heat Standard for Maryland. Prepared for by Regulatory Assistance Project for the Maryland Department of the Environment. October 2023. P. 64. <https://www.raponline.org/knowledge-center/meeting-thermal-challenge-clean-heat-standard-maryland/>

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“Should a CHS policy include alternative compliance payments, cost caps or other “off-ramps” to address concerns about the costs of compliance? If so, how should they be structured?”

Concerns are often raised about how implementation of a CHS will impact costs. This is not surprising given that policy makers, particularly legislators, are responsible for answering constituent concerns about the potential for significant increases in heating costs.

In the electric sector, there are multiple states with RPS policies that have not seen electricity rates skyrocket as a result of the RPS.¹⁴² This result is likely due to a number of factors, but one is that the structure of a performance standard drives competition and innovation. Offering flexibility and choice within clear rules and guardrails sets a playing field for market actors to find ways to achieve emission reductions at the lowest reasonable cost. That said, electric RPS policies across multiple states currently include a variety of cost containment provisions, with the most common being an alternative compliance payment or mechanism (ACP or ACM).¹⁴³ Other electric RPS cost containment mechanisms that have been utilized include rate impact or revenue requirement caps, renewable energy contract price caps, surcharge caps (Colorado, Michigan, and North Carolina) and renewable energy fund caps (New York). Several states have a rate impact cap, with retail cost increases (due to the RPS) capped at a range of 1.5% (North Carolina) to ~38% (Washington, D.C.). Washington, D.C., is an outlier – far more states fall at the 2% and 7% cap levels, with a few landing at ~15-16%.¹⁴⁴

Because clean heat standards have only very recently begun to be considered and adopted, there is virtually no track record of actual impacts on fuel or heating costs. This uncertainty could fuel political interest in cost containment provisions. As mentioned repeatedly, 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 mandated thermal emissions reductions are achieved. Thus, any economic or cost “off ramp,” including a rate impact cap or an ACP, will essentially allow for the possibility of falling short of state emission reduction goals.

¹⁴² https://www.nrel.gov/analysis/assets/pdfs/rps_costs_and_benefits_6-10-14.pdf *AND* <https://www.nrel.gov/docs/fy16osti/65005.pdf> A prospective analysis is available at: <https://www.nrel.gov/docs/fy17osti/67455.pdf>

¹⁴³ An ACP is a payment made by an obligated entity in lieu of supplying the required credits. Its value is typically expressed in dollars per megawatt-hour (\$/MWH).

¹⁴⁴ State Renewable Portfolio Standards and Goals. National Conference of State Legislators. Updated August 31, 2021. <https://www.ncsl.org/energy/state-renewable-portfolio-standards-and-goals>

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The goal of the CHS is not to require obligated parties to pay a fee; it is to drive market change towards cleaner heat options that result in equipment and envelope changes within buildings and businesses. Importantly, the principal concern about costs is typically focused on impacts to low-income customers who cannot easily transition off the gas system. Thus, rather than implementing a cost containment provision such as an ACP, we recommend including equity provisions within the CHS structure and supporting other complementary policies like low-

income rates, rental efficiency standards and utility on-bill financing options (all discussed in more detail, below). We do not recommend including an ACP within CHS design. However, in

the event that an ACP is included in a CHS, we recommend that the funds generated be used to support LMI measures (see Section 4.9 for more information).

THE GOAL OF A CHS IS NOT TO HAVE OBLIGATED PARTIES PAY A FEE; IT IS TO DRIVE MARKET CHANGE TOWARDS CLEANER HEAT OPTIONS. THUS, AN ACP IS NOT RECOMMENDED. HOWEVER, IF THERE IS AN ACP, IT SHOULD BE SET HIGHER THAN THE COST TO ACQUIRE CREDITS.

Recommendations

- An ACP or cost cap should not be included in a CHS. However:
 - If such a mechanism is included in the CHS design, then it should be set at a high enough level that obligated parties find it less expensive to invest in clean heat measures in the vast majority of cases
 - If an ACP is included in the CHS, then generated funds should be used to support LMI measures.
- To address concerns about cost impact to low-income ratepayers, the CHS should include equity provisions and the CHS should be supported by complementary policies that address rate and bill impact concerns.

Field Applications

One of the critical challenges of Colorado's CHS is the statutorily set 2.5% cost cap, an arguably low cap. In contrast, PSCo (Xcel Energy) recently proposed a 13% gas rate increase from 2022 to 2024 for residential and small commercial customers. The PUC denied this request, instead

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approving a 2.9% increase for residential customers and a 3.1% increase for small businesses.¹⁴⁵ Meanwhile, electric rate increases are also occurring, with the PUC having approved a 4.4% rate hike for more than 1.6 million electricity customers. This is in addition to a previous rate increase that occurred in April of 2022.¹⁴⁶ As mentioned earlier, one of the portfolios required by statute does not need to meet the cost cap. Statute also allows for the PUC to approve, or amend and approve, a clean heat plan with costs greater than the cost cap, but “only if it finds that the plan is in the public interest, costs to customers are reasonable, the plan includes mitigation of rate increases for income-qualified customers, and the benefits of the plan, including the social costs of methane and carbon dioxide, exceed the costs.”¹⁴⁷ Thus, there are opportunities for utilities to propose portfolios that go above 2.5%, but the hurdles for approval are likely not insignificant.

Vermont’s CHS does not include a cost cap nor an ACP. Rather, its primary cost containment mechanism (described earlier) involves allowing the Vermont PUC to temporarily adjust the annual CHS requirements for a variety of reasons, including cost concerns. Further, the adjustment can be in place for up to three years. It is understandable that, politically, some “out” clause would be needed, particularly for a relatively “untried” policy such as a compliance market for thermal energy. However, this is a striking degree of deference to the PUC, and flexibility for the obligated parties. Again, it remains to be seen how things play out.

MassDEP’s March 2023 document for stakeholder review and feedback states:

“One widely used option is to allow an alternative compliance payment option (ACP), whereby regulated energy suppliers could make a payment in lieu of holding compliance credits. This option has the added advantage that it assists regulated companies in planning for compliance by placing an upper limit on compliance costs. Also, because MassDEP could use the payments to fund additional reductions in future years..., it can partially compensate for additional emission that occurred because of the failure to achieve enough creditable reductions in a particular year. The ACP level could be established with reference to the

¹⁴⁵ Weister, S. “Xcel Energy’s natural gas rate hike proposal slashed by regulators, saving customers millions.” October 25, 2022. Updated September 18, 2023. The Denver Gazette.

https://denvergazette.com/news/business/xcel-energys-natural-gas-rate-hike-proposal-slashed-by-regulators-saving-customers-millions/article_b8a9ce3e-54b1-11ed-a72a-db3ad3de9675.html

¹⁴⁶ Brasch, S. “Xcel Energy customers can expect higher electricity bills starting in September.” August 17, 2023. CPR News. <https://www.cpr.org/2023/08/17/xcel-energy-electricity-bills-rate-increase/#:~:text=The%20increase%20stacks%20atop%20a,average%20gas%20customer's%20monthly%20bill.>

¹⁴⁷ §40-3.2-108. (6)(d)(III), C.R.S.

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social cost of carbon or with reference to anticipated technology costs. Using anticipated technology costs might be particularly appropriate for an electrification requirement, as the Mass Save program has already established \$10,000 as an appropriate incentive for conversions to a fully electrified home.”¹⁴⁸

The more recent, November 2023 draft framework proposes an ACP level of \$6,000 for a residential space heating project. Given that full electrification of an existing residential home will typically cost more than \$6,000, this level is too low. 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, it is recommended that there be a check back mechanism that examines the cost of electrification, allowing for an adjustment to the ACP in future years.

The two presentations held in Maryland indicate that various cost containments are at least being considered. These “safety valve” provisions include slowing the pace of the requirements and capping program costs. The more recent December 2023 Climate Plan does not mention an ACP.

4.8 Ensuring compliance

Key questions:

- *How will achievement of emission reduction obligations be evaluated and verified?*
- *Should there be enforcement penalties if obligations are not met? How should they be structured?*
- *How can a CHS address the potential challenges that smaller obligated parties would face in meeting their emission reduction obligations?*

There are at least four mechanisms by which compliance can be supported. This includes the opportunity for obligated parties to pay an ACP or ACM, discussed previously. Note that this mechanism can be both a means to contain cost and assist with compliance. As discussed in Section 4.7, an ACP is not an ideal mechanism to utilize, since it means the goal of the CHS –

¹⁴⁸ MassDEP Stakeholder Discussion Document. Clean Heat Standard Program Design. March 2023. P. 7. <https://www.mass.gov/doc/clean-heat-standard-discussion-document/download>

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driving GHG emissions reductions down through delivered activities at the building level – is not being met. Other compliance tools include setting up verification and evaluation processes, setting non-compliance penalties, and creation of a DDA (the latter two have been discussed previously). These are described more fully below.

4.8.1 Evaluating and verifying compliance

Key questions:

“How will achievement of emission reduction obligations be evaluated and verified?”

Section 4.2 describes how the high level CHS requirements can be set by policy makers to align with overarching climate requirements while regulators can set annual percentage requirements for each obligated party, based on modeling results, market dynamics and stakeholder input. However, there will need to be a regularly occurring “trueing up” to determine whether obligated parties have met their percentage requirements and what this means “on the ground.” A CHS statute should identify an entity – options include the PUC, the state energy planning office, and/or a hired expert third-party evaluator – to annually assess and report on compliance. This process should include an informal opportunity for parties to resolve any issues, as well as an opportunity for obligated parties and others to comment on a draft version of the report.

Like energy efficiency programs, there should be regular evaluation, verification and measurement (EM&V) processes for the CHS to ensure that compliance reports are reflecting actual delivery and performance of clean heat measures “in the field.” This information can then be used to inform the TAG (discussed in Section 4.6.2) during technical review and by regulators to assess whether the CHS program needs modification.

Recommendations:

- The state should identify an entity to annually assess and report on compliance, provide an informal opportunity for parties to resolve and discuss compliance related issues.
- As is done for energy efficiency, there should be regular evaluation, verification and measurement (EM&V) processes for the CHS.
- Findings from EM&V studies should be used to inform whether modifications are needed within the CHS program to ensure emissions reductions are being achieved.

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Field Applications

Colorado's CHS involves reporting to and review by the PUC, utilizing a GHG emissions reporting methodology developed and managed by the Air Pollution Control Division. Colorado's PUC also oversees energy efficiency and beneficial electrification programs via the "Strategic Issues" (SI) proceedings, held once every five years. This proceeding considers the:

overall structure and objectives of demand-side management (DSM) proceedings and cover multiple years, while the specifics of energy efficiency, demand response, and related programs are addressed through separately filed plans. This application includes both electric and gas issues, and also includes beneficial electrification... Issues included in the application are the appropriate levels of electric and gas energy efficiency and demand saving...program budgets, beneficial electrification and other program incentives, income-qualified program eligibility, measurement and verification, and financial incentive mechanisms.¹⁴⁹

During the SI proceeding, regulators determine whether current goals and requirements are being met and course correct, as needed. Fortunately, the previous SI planning period is ending soon, thereby offering an opportunity to determine where the state is currently at with regards to meeting GHG emission reduction requirements, assess how the CHS may interplay with existing programs and program results, and determine whether existing efficiency, electrification and CHS targets must be modified to ensure overall emissions reductions targets are met.

Vermont's CHS relies heavily upon the ongoing use of the TAG structure that is currently used to determine, review and modify technical elements of energy efficiency program design. The TAG will be responsible for:

1. *Establishing and revising the lifecycle carbon dioxide equivalent (CO₂e) emissions accounting methodology to be used to determine each obligated party's annual requirement*
2. *Establishing and revising the clean heat credit value for different clean heat measures*

¹⁴⁹ Proceeding No. 22A-0309EG. Public Service Company of Colorado. 2024-2027 Demand-Side Management Strategic Issues and Beneficial Electrification Proceeding. <https://puc.colorado.gov/key-proceedings>

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3. *Periodically assessing and reporting to the Commission on the sustainability of the production of clean heat measures by considering factors including greenhouse gas emissions; carbon sequestration and storage; human health impacts; land use changes; ecological and biodiversity impacts; groundwater and surface water impacts; air, water, and soil pollution; and impacts on food costs*
4. *Setting the expected life length of clean heat measures for the purpose of calculating credit amounts*
5. *Establishing credit values for each year over a clean heat measure's expected life, including adjustments to account for increasing interactions between clean heat measures over time so as to not double-count emission reductions*
6. *Facilitating the program's coordination with other energy programs*
7. *Calculating the impact of the cost of clean heat credits and the cost savings associated with delivered clean heat measures on per-unit heating fuel prices*
8. *Calculating the savings associated with public health benefits due to clean heat measures*
9. *Coordinating with the Agency of Natural Resources to ensure that greenhouse gas emissions reductions achieved in another sector through the implementation of the Clean Heat Standard are not double-counted in the Vermont Greenhouse Gas Emissions Inventory and Forecast*
10. *Advising the Commission on the periodic assessment and revision requirement; and*
11. *Any other matters referred to the TAG by the Commission.*¹⁵⁰

The various CHS-related documents that are currently available from Massachusetts and Maryland do not go into significant depth regarding CHS EMV. However, both states have robust regulatory structures and existing efficiency, electrification and renewables programs. Further, the most recent November 2023 draft framework from MassDEP does mention that program reviews would be required in 2028 and every five years thereafter to address all aspects of program design and implementation.¹⁵¹ Thus, one can assume that policy makers will look to build upon existing infrastructure to ensure appropriate oversight of CHS compliance, including EMV.

¹⁵⁰ 30 V.S.A. Chapter 94. §8128.

¹⁵¹ MassDEP Clean Heat Standard (CHS) Draft Framework for Stakeholder Comment Only. November 2023. P. 7. <https://www.mass.gov/doc/chs-draft-program-framework>

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4.8.2 Setting penalties for non-compliance

Key question:

“Should there be enforcement penalties if obligations are not met? How should they be structured?”

One approach to incentivizing obligated parties to comply with the CHS is to require payment if and when the obligation is not met. For the penalty payment to be effective, it must be significantly more expensive than the expected cost to acquire credits (through any of the five approaches mentioned in Section 4.6.1). The funds collected from non-compliance penalties can be used – in whole or in part – to support delivering clean heat measures to lower income communities. Additionally, if LMI carve outs are established, the CHS could also include an additional non-compliance penalty payment for not meeting the LMI carve out. However, it will be important to ensure that regulated obligated parties do not simply pass this expense on to ratepayers.

Additionally, policy makers may consider providing regulators with the authority and flexibility to void penalties if certain conditions are met. For example, conditions could include (1) demonstration of good faith efforts to meet the obligation, (2) achieving at least 90% of the obligation (i.e., less than 10% shortfall), and (3) a commitment to make up the shortfall in the subsequent year.

Recommendations:

- Non-compliance penalties should be incorporated into a CHS.
- Non-compliance penalties should be significantly more expensive than the cost to acquire credits.
- Funds received from non-compliance penalties should be used – entirely or partially – to support CHS delivery to LMI customers.
- Consideration should be given to setting a non-compliance penalty payment specific to non-compliance with the LMI carve out (see Section 4.9).
- Obligated parties that are regulated (i.e., gas distribution utilities) should be prohibited from passing the cost of any non-compliance penalties onto their customers.

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Field Applications

Colorado's CHS does not include a non-compliance penalty mechanism. When asked what the enforcement mechanism is, in the event that an obligated party fails to comply, one interviewee replied that the PUC's decision to approve a CH plan is, itself, a legally enforceable decision that is binding. This interviewee highlighted that while there is no specific payment penalty written into the CHS statute, the PUC, having oversight over cost recovery, could address non-compliance via other actions such as deeming investments to be imprudent and not allowing cost recovery.

As discussed earlier, Vermont's CHS does include a non-compliance penalty. But, as described in Section 4.7, it also provides obligated entities with an opportunity to not have to pay it if they show a good faith effort to comply, and if they can document that market forces outside of their control were the reason for non-compliance. To prevent abuse of this opportunity, statute further articulates that "false or misleading statements or other representations made to the Commission by obligated parties related to compliance with the Clean Heat Standard are subject to the Commission's enforcement authority, including the power to investigate and assess penalties...."¹⁵²

MassDEP regulators did not mention a non-compliance penalty mechanism in publicly available documents, nor do the publicly available Maryland documents.

4.8.3 Creating a default delivery agent



Key question:

"How can a CHS address the potential challenges that smaller obligated parties would face in meeting their emission reduction obligations?"

Depending on the jurisdiction, a default delivery agent (DDA) may or may not be necessary to ensure that a CHS is effectively and equitably implemented across the entire jurisdiction. Because it is easier to define a DDA while developing the CHS, we recommend program designers incorporate a DDA at the start of the CHS program design; if it is ultimately not

¹⁵² 30 V.S.A. Chapter 94. §8124.(f).(4).

needed, then implementation of the DDA does not need to move forward. Given the scale and timeframe for many thermal sector emission reduction mandates – and the relative lack of progress thus far – it is better to have the structure of a DDA in place, if needed, rather than having to develop the structure and implement it after a CHS has been implemented and non-compliance has been identified.

The process of selecting a DDA can be similar to how many efficiency utilities are chosen, via identification and appointment through a competitive procurement process. As discussed earlier, a DDA can be helpful for smaller energy service providers (e.g. municipal gas utilities and oil/propane fuel dealers) to comply with a CHS. For example, an obligated party may not be interested in directly delivering clean heat measures or working with other businesses/contractors to ensure measures are delivered/installed. For some entities, simply paying into a DDA may be the preferred compliance path.

In the event that non-compliance penalty payments are made, there will be a need for a mechanism to deploy those funds. The DDA could also fulfill this need.

Interestingly, a DDA may be seen positively and negatively by obligated parties. For entities that are not interested in offering CHS activities, a DDA may be viewed as being helpful to ensure compliance. On the other hand, some energy service businesses may view a statewide DDA as a competitor, potentially having a “leg up” if it receives funds resulting from penalty payments.

Depending on the DDA – in particular its’ financial resources and the scale of its’ obligation - it could also be a helpful mechanism with regards to public outreach and education about the CHS. This could include providing a centralized resource of information explaining how different clean heat measures work, providing resources to incentives and tax credits, and connecting obligated parties to other entities that may provide clean heat services such as weatherization and installation of efficient equipment. Ultimately, whether a DDA is needed and the role it plays will vary depending on the pre-existing market landscape.

Recommendations:

- Determination of the need for a DDA should be made depending on the characteristics of the specific CHS jurisdiction.
 - A DDA may not be needed, for example if the only obligated entities are reasonably-sized, regulated utilities.

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- If a DDA might be needed, it is better to incorporate a DDA at the start of the CHS program design, rather than after the CHS has been implemented.
- The DDA selection process can be similar to processes used to select efficiency program administrators.
- If mechanisms such as a non-compliance penalty or ACP are incorporated into a CHS, a DDA can be a useful entity to circulate any revenue back to customers (in particular, LMI).
- If a DDA is created, it can be used to act effectively as a clearinghouse and jurisdiction-wide resource.

Field Applications:

Colorado does not have a DDA.

Vermont's statute does include a role for a DDA, in large part because there are many small fuel dealers that may not have the capacity or interest to actively participating in the CHS. However, it remains to be seen what the uptake will be from obligated entities for the DDA, as the Vermont Fuel Dealers Association has filed comments during the regulatory process stating that the PUC should not assume fuel dealers are not interested in actively engaging in the credit market.

MassDEP does not identify a DDA, per se. However, in the March 2023 materials, regulators did state that "some accommodation may be desirable to address the fact that some of these companies are quite small and may find reporting emissions and purchasing credits to be administratively challenging."¹⁵³

Maryland's documentation does not mention a DDA, either.

¹⁵³ MassDEP Stakeholder Discussion Document. Clean Heat Standard Program Design. March 2023. P. 5. <https://www.mass.gov/doc/clean-heat-standard-discussion-document/download>

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4.9 Designing for Equity

It is critically important that equity considerations be central to all CHS design decisions – with input from stakeholders from disadvantaged communities sought at the outset of a design process.¹⁵⁴

Key questions:

- *Could a CHS adversely affect economically disadvantaged individuals, households and communities?*
- *How could a CHS be designed to address equity concerns?*

IT IS CRITICALLY IMPORTANT THAT EQUITY CONSIDERATIONS BE CENTRAL TO ALL CHS DESIGN DECISIONS, INFORMED BY STAKEHOLDER INPUT.

Could a CHS adversely affect economically disadvantaged individuals, households and communities?"

Nationally, low income households spend a greater percentage of their income on home energy costs (e.g. natural gas, electricity and other heating fuels) than others do.¹⁵⁵ This is referred to as “energy burden.” A CHS should be designed – from start to finish – with this in mind, incorporating as many ways to reduce energy burden as possible. There are a few reasons for this recommendation. First, some households who can afford to invest in their homes to reduce future energy consumption and costs are already doing so. Second, decades of program implementation in energy efficiency have shown that reaching this demographic requires more effort, time and money.

Thus, if the CHS structure leaves 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 low and

¹⁵⁴ The authors wish to emphasize that this section on how to address equity concerns is presented fairly late in this paper only because we felt that there was a need to first establish a general understanding of how the mechanics of a CHS could and should work as important context for discussion of how to address equity issues.

¹⁵⁵ “Low-Income Household Energy Burden Varies Among States – Efficiency Can Help In All of Them.” U.S. Department of Energy. Office of Energy Efficiency and Renewable Energy. DOE/GO-102018-5122. December 2018. https://www.energy.gov/sites/prod/files/2019/01/f58/WIP-Energy-Burden_final.pdf

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moderate income (LMI) homes. This would result in the CHS adversely affecting economically disadvantaged households, as they would receive a much lower proportional share of the benefits of decarbonization (e.g., reduced energy bills from electrification and/or weatherization) and a disproportionately high share of the cost of paying off gas utility infrastructure investments.

“How could a CHS be designed to address equity concerns?”

There are a few different mechanisms that can be deployed to address income equity concerns, all with their own benefits and drawbacks. These include:

- A carve out requiring a certain percentage of the CHS credits to come from providing CHS measures/activities to low income ratepayers
 - To make the measures have a deeper, longer value for the customer, a portion (or all) of the LMI carve-out could be required to come from “long-lived” measures
- Supporting LMI ratepayers in paying for CHS measures/credits through various revenue sources, including:
 - Imposing a fee on non-LMI measures
 - If there is an ACP included in the CHS, directing all payments towards LMI measures
- Setting a higher credit value for LMI measures
- Making large, multi-family property owners who rent/lease housing to LMI ratepayers be obligated parties with specific LMI requirements

However, even if the CHS deploys some or all of the mechanisms listed above (which is not necessarily recommended), optimizing the design of a CHS to address equity is not likely to be enough to ensure that those with the greatest energy burden are not further harmed. It is highly likely that additional complementary policies such as rental efficiency standards, low income rates, greater investment in bill payment assistance programs, on-bill no-or-low interest financing will be needed to ensure that LMI customers are not placed in an even greater economic disadvantage. Section 5 discusses this further.

LMI carve out

A key mechanism to ensuring that a CHS guides market actors to serve LMI residents is to create a LMI carve out. This involves requiring that a minimum percentage of credits come from activities serving LMI residents; this “guarantee” that emissions reductions occur in LMI

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households is why this recommendation is preferred and strongly recommended. To make this carve out more meaningful, the credits can be further defined as having to be “long-lived” measures. This would result in the market providing LMI customers with measures such as weatherization and heat pumps rather than short-lived emission reduction measures such as biofuels, ultimately leading to longer term savings in both energy and cost.

Financially supporting LMI ratepayers to invest in CHS measures

To further reduce hurdles for LMI ratepayers to benefit from a CHS, funds can be provided to assist in paying for the measures/activities. There are a few different options for bringing in funds. One includes imposing a fee on non-LMI measures (as is being proposed in Massachusetts – discussed further, below). This supports a LMI carve out by placing even more of a market incentive to invest in LMI measures. It also assists in creating a fund to invest in LMI measures. Note that we list this fee mechanism second to the carve out because it doesn’t guarantee that LMI ratepayers receive emissions reductions opportunities. However, there are benefits to it in that it does not simply rely on market price signals, it generates money for LMI projects and (unlike the proposal to increase the credit value of LMI measures) it does not distort the GHG emissions reduction values of various measures. Additionally, in the previous section, we recommended that an ACP not be immediately included within a CHS. However, if there is an ACP, then the collected funds should be set aside for supporting CHS activities serving LMI communities.

Setting a higher credit for LMI measures

Another potential mechanism to support LMI residents receiving benefits from the CHS includes setting a higher value for credits associated with work done in LMI households. The advantage of this is that it provides a market incentive for LMI measures. However, there are significant disadvantages. First, this would result in assigning more emission reduction value to a LMI credit than it is actually worth environmentally. This concern could potentially be addressed by then increasing the total number of credits that have to be earned each year, but regulators would have to guess at what that number should be as it is not necessarily easy to forecast how many LMI investments would occur based on a change in the market signal. Second, and relatedly, regulators would then need to predict how much to increase the value of LMI credits to elicit a sufficient market response. In short, this approach distorts the market to try to get an outcome while also increasing uncertainty as to whether that outcome will be achieved, and whether the other critical objective of total emission reductions will be achieved. We do not

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recommend this approach, particularly when policy makers can simply require the outcome that is desired through carve outs, and then let the market determine how to meet the carve out at the lowest cost.

Making large multi-family property owners serving LMI households obligated parties

In Section 4.3, we mentioned the potential for landlords or commercial property owners with a certain level of real estate square footage to be considered as an obligated party. This is another potential approach to ensuring that multi-family property owners improve their building assets via energy-related improvements. However, the design of this would have to be carefully thought through. Specifically, if a building owner were to increase the rent of a property due to the improvements in the building, and if the rental increase was more than the energy cost savings resulting from the energy upgrades, then the policy intent to mitigate economic hardship would not have been achieved. Another drawback to this approach is the added administrative burden and market complexity associated with increasing the total number of obligated parties. Thus, we do not recommend this approach and rather recommend coordinating the CHS with a complementary policy such as a rental efficiency standard.

Regardless of which mechanism(s) policy makers and regulators choose to deploy, they must be coordinated with other programs and policies to ensure maximum leveraging and optimal results. Depending on which policies and programs are already being implemented (or not), regulators and policy makers should also consider pursuing additional policy initiatives to support LMI ratepayers. This is discussed further in Section 5.

Finally, significant outreach and inclusion in program design should occur with individuals and community groups representing LMI residents. There are multiple reasons for this, such as the opportunity to improve program design through more diverse perspectives and input, and the potential for greater program success as more people are aware of the various resources available to them to reduce energy burden. This will involve time, effort and financial resources. Asking individuals who are barely making ends meet, who are likely unfamiliar with (and potentially intimidated by) the energy industry, to participate in discussions about a CHS is a large request, and it may be denied. Policy makers and program designers should nevertheless invite, pay and listen to the input of individuals who could be most negatively impacted by a CHS (particularly if the program is not designed to meet their unique needs and circumstances).

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Recommendations:

- The CHS should be designed – from beginning to end – with equity at the forefront of considerations.
- Create a LMI carve out whereby a minimum percentage of credits must come from clean heat measures provided to LMI customers.
 - To increase the customer-value of the carve out, require that the clean heat measures (or resources) be “long-lived” measures (e.g. weatherization and heat pumps rather than biofuels).
- Consider placing a fee on non-LMI measures to create a revenue source to support LMI measures and programs.
 - If there is an ACP (not recommended), reserve payments to support LMI measures and programs.
- Ensure coordination and alignment between the CHS design and existing LMI-focused energy programs and services.
- Pursue other complementary policies to minimize low income energy burdens, including increased investment in bill payment assistance programs, low-income rates and rental efficiency standards (see Section 4.9).
- Involve representatives of disadvantaged communities in all stages of CHS design.

Field Applications

Colorado statute considers equity in a variety of ways. To begin with, the statute declares that “Colorado is focused on a transition to a decarbonized economy that recognizes the historic injustices that impact lower-income Coloradans and black, indigenous, and other people of color who have borne a disproportionate share of environmental risks while also enjoying fewer environmental benefits.”¹⁵⁶ It also directs the PUC to “maximize greenhouse gas emission reductions and benefits to customers, with particular attention to residential customers who participate in income-qualified programs....”¹⁵⁷

In addition to these overarching statements, the statute mandates that proposed clean heat plans “prioritize investments that ensure that disproportionately impacted communities or customers who meet requirements for income-qualified programs benefits from the investments made to implement the clean heat plan.”¹⁵⁸ Additionally, in order for the PUC to

¹⁵⁶ §40-3.2-108.(1)(c)(II) C.R.S.

¹⁵⁷ §40-3.2-108.(1)(c)(III), C.R.S.

¹⁵⁸ §40-3.2-108.(4)(c)(V), C.R.S.

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approve a CHP, it must determine that the plan is in the public interest, taking into account “whether investments in a clean heat plan prioritize serving customer participating in income-qualified programs and communities historically impacted by air pollution and other energy-related pollution.”¹⁵⁹ External to the CHS statute and regulatory process, but critical to the discussion of energy burden, are the multiple recent PUC decisions and new state laws that attempt to balance utility shareholder profit with rate increases.¹⁶⁰

Vermont statute also has multiple ways in which equity is addressed. Similar to Colorado, Vermont’s Affordable Heat Act includes broad policy goals to address equity concerns related to energy burden, environmental pollution and more. However, Vermont’s statute includes greater detail – beyond directing that investments prioritize specific demographics – such as:

- Clearly defining low income as a “customer with a household income of up to 60 percent of the area of statewide median income, whichever is greater” and moderate income as “a household income between 60 percent and 120 percent...”¹⁶¹
- Requiring that not just LMI customers and households with the highest energy burdens are prioritized, but also “residents of manufactured homes, and renter households with tenant-paid energy bills.”¹⁶²
- Creating a LMI carve-out such that *each obligated party shall retire at least 16 percent from customers with low income and an additional 16 percent from customers with low or moderate income. For each of these groups, at least one-half of these credits shall be from installed clean heat measures that require capital investments in homes, have measure lives of 10 years or more, and are estimated...to lower annual energy bills. Examples shall include weatherization improvements, and installation of heat pumps, heat pump water heaters, and advanced wood heating systems. The Commission may identify additional measures that qualify as installed measures.*¹⁶³

Additionally, Vermont statute requires that the PUC “to the extent reasonably possible, frontload the credit requirements for customers with low income and moderate income so that the greatest proportion of clean heat measures reach Vermonters with low income and moderate income in the earlier years.”¹⁶⁴

¹⁵⁹ §40-3.2-108. (6)(d)(l)(c), C.R.S.

¹⁶⁰ See Section 5.7 for specific examples.

¹⁶¹ 30 V.S.A. Chapter 94. §8123. (5) and (6).

¹⁶² 30 V.S.A. Chapter 94. §8124(d)(1).

¹⁶³ 30 V.S.A. Chapter 94. §8124 (d)(2) and (3).

¹⁶⁴ 30 V.S.A. Chapter 94. §8124 (d)(2) and (3).

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- Mandating that “all funds received from non-compliance payments...be used...to provide clean heat measures to customers with low income.”¹⁶⁵
- Requiring that, in the event that a DDA is established, this entity “create specific programs for *multiunit dwellings, condominiums, rental properties, commercial and industrial buildings, and manufactured homes.*”¹⁶⁶ (See Sections 4.6.1 and 4.8.3 for more details regarding a DDA).
- Requiring the establishment of a CHS equity advisory group “to assist the Commission in developing and implementing the Clean Heat Standard in a manner that ensures an equitable share of clean heat measures are delivered to Vermonters with low income and moderate income and that Vermonters with low and moderate income who are not early participants in clean heat measures are not negatively impacted in their ability to afford heating fuel.” This group is charged with providing feedback on engagement strategies, assessing whether customers are equitably served and how to increase equity, identifying actions needed to better serve LMI customers and mitigate fuel price impacts, recommending additional programs, incentives or funding needed to support LMI, providing feedback on the impact of the CHS on LMI customers, as well as on renters and residents of manufactured homes. Advisory group members are paid for their time and expenses if they are not otherwise compensated (e.g. through an employer). This group must also complete a report for the General Assembly regarding equity issues prior to CHS adoption, thereby creating another opportunity for legislative review and further accountability.¹⁶⁷

In its first stakeholder focused document (March 2023), MassDEP reprints recommendations made by the Clean Heat Commission, including the need for the CHS to “be designed to include and protect low- and moderate- income (LMI) and Environmental Justice (EJ) populations from the outset. To achieve this objective, the Commission recommends requiring obligated parties to include a specified percentage of credits generated in LMI and EJ populations and households in their annual compliance filings.”¹⁶⁸ MassDEP specifically asks for stakeholder comment as to whether a carveout is a good approach to ensuring equity.

MassDEP also asks whether it would be appropriate to utilize ACP revenue “to provide ongoing support to LMI customers that fully electrify their homes (e.g. direct bill assistance, free routine maintenance, etc.). MassDEP offers that one way to generate consistent revenue for LMI

¹⁶⁵ 30 V.S.A. 8125.(f).

¹⁶⁶ 30 V.S.A. 8125. (g). Italics those of the authors.

¹⁶⁷ 30 V.S.A. §8129.

¹⁶⁸ MassDEP Stakeholder Discussion Document. Clean Heat Standard Program Design. March 2023. P. 2. <https://www.mass.gov/doc/clean-heat-standard-discussion-document/download>

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support “might be to charge a ‘just transition fee’ to register creditable projects that do not support equitable outcomes, with funds dedicated to support projects that do. In addition to the direct spending impact, this would support equitable outcomes because projects that benefit LMI consumers, renters, or communities that suffer from poor air quality would inherently be favored because they would not be subject to the just transition fee.”¹⁶⁹ Finally, MassDEP asks stakeholders how an economic analysis of a CHS can be “structured to inform equitable program design that benefits LMI energy consumers.”¹⁷⁰

MassDEP’s November 2023 draft framework provides multiple ways to incorporate equity considerations:

- Including a low income carve out of 25% of the “full electrification” conversion standard.
- Directing all ACP funds resulting from the low-income carve out to future low-income full electrification projects.
- Requiring a “just transition” fee of 10% of the annual full electrification credit ACP value for the first transfer of each full electrification credit that is not eligible for the equity carve out. All generated funds would go to assisting low-income consumers during the clean heat transition.
- Considering other options for providing additional support to low-income households when cold weather or high energy prices result in abnormally high home heating costs.¹⁷¹

Maryland’s publicly available documents shows that a focus on equity and affordability is inherent to current deliberations. Examples include specific questions such as “How to promote equity?” as well as the mentioning of the following guardrail: “Progressive inclusion mandate – to deliver clean heat solutions to **low- and moderate-income households.**”¹⁷²

¹⁶⁹ Ibid. P. 8.

¹⁷⁰ Ibid. P. 10.

¹⁷¹ Maryland’s Climate Pollution Reduction Plan: Policies to Reduce Statewide Greenhouse Gas Emissions 60% by 2031 and Create a Path to Net-Zero by 2045. December 28, 2023. P. 34 – 43.

<https://mde.maryland.gov/programs/air/ClimateChange/Maryland%20Climate%20Reduction%20Plan/Maryland%27s%20Climate%20Pollution%20Reduction%20Plan%20-%20Final%20-%20Dec%2028%202023.pdf>

¹⁷² See the “Clean Heat Standards” presentation associated with the February 16, 2023 Maryland Commission on Climate Change Mitigation Working Group, available at:

<https://mde.maryland.gov/programs/air/ClimateChange/MCCC/Pages/MWG.aspx>

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5. Other policies and integration/coordination with a CHS

While the CHS is an overarching policy to address thermal sector emissions reduction requirements, other policies and programs will be necessary to ensure climate mandates are achieved in a manner that is as affordable, equitable and strategic as possible. If designed and implemented effectively, a CHS can result in multiple additional benefits beyond emissions reductions. These include, but are not limited to lowering energy costs, increasing resilience, supporting efficient cooling, promoting jobs, improving indoor and outdoor air quality - and therefore public health. However, for a CHS to be as successful as possible, policies aligned with the CHS will be needed to address:

- Strategically decommissioning the existing gas system
- Equitable rate design that supports decarbonization policy
- Ensuring the installation of efficient equipment and electric sector decarbonization
- Workforce needs and opportunities.

5.1 Strategically decommissioning the existing gas system

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 capital investment in and the cost of maintaining their distribution systems. This is particularly important in the context of current gas utility plans to invest billions of dollars replacing aging pipes.

Regulators should require gas utilities to identify areas where complete electrification of a neighborhood can avoid expensive pipe replacements through strategic, planned pruning of the gas system. State entities overseeing different policies must coordinate 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.

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In addition, CHS regulators should require that obligated gas utilities 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. All state entities involved in energy planning and regulation should be collaborating in the review of gas utility forecasts, infrastructure maps, and gas system safety and enhancement plans to ensure that the market-based CHS is accompanied with sensible, planned divestment in gas infrastructure.

While the need for a planned, staged, strategic decommissioning of the gas system is clear from a climate, cost and equity perspective, thus far there are very few examples to point to. Including RNG and green hydrogen (albeit within tight guardrails) as eligible clean heat measures opens the door for fossil fuel providers to over-invest in such measures – i.e., to levels that are not consistent with minimizing costs or risk or adverse effects on low income energy burdens – simply because they advance the gas industry’s business interests. Unless there are other policies in place to require phased, tactical decommissioning of the gas system, the hoped for results from a CHS (reduced emissions and, over the long-term, reduced costs) will likely not be achieved.

Recommendations:

- Require a "future of gas" proceeding in which the state, through an independently hired contractor and a stakeholder process, analyzes decarbonization pathways - and periodically (e.g., every 5 years) redo the study based on updated information
- Require gas utilities to file near-term (5 year) and longer-term (20-year) plans for how they will decarbonize, consistent with the results of the future of gas study results
- Require gas utilities to simultaneously file with PUCs distribution system plans that identify all system needs
- Require that gas utilities distribution system plans routinely consider non-pipe alternatives to capital investments, specifically including consideration of options for “pruning” their systems
- Eliminate any existing subsidies or allowances for new gas connections
- Consider accelerated depreciation of any new assets and potentially for existing assets (recognizing that this will increase rates in the short-term but reduce the risk of stranded assets in the long-term).

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Field Applications

Colorado's CHS statute does not require gas utilities to consider gas system infrastructure, with the exception of the role of leaks within the system, as part of the CHS. However, the PUC went beyond the legislature's requirements to develop CHS rules, recognizing and requiring a revisiting of Colorado's gas infrastructure planning rules. This proceeding is currently ongoing.¹⁷³ Additionally, and separate to the CHS, 2023's SB-291 was passed, requiring "state energy officials to study the long-term future of natural gas, and the potential risks of 'stranded or underutilized' gas infrastructure as Colorado transitions away from fossil fuels."¹⁷⁴ This bill also bans "utilities' cost recovery of expenses such as lobbying and advertising in rate hikes" (which could, presumably, reduce the influence which Colorado's two investor owned utilities may have with legislators), instead rather "allowing the PUC to limit their cost recovery for attorneys testifying for the need for rate hikes." Finally, this bill bans the continuation of a 28% discount for new gas line extensions.¹⁷⁵ Other initiative are also underway, including gas infrastructure planning efforts and the upcoming Strategic Issues proceeding. Thus, while the CHS does not require coordination and planning, there are multiple processes underway to address gas system planning.

Vermont's statute also does not include requirements regarding gas infrastructure planning. Nor does it direct regulators to coordinate and integrate policies associated with long-term gas system planning. However, as noted before, Vermont's one monopoly gas utility has a limited service territory. This is not to say that consideration does not need to be given to how to reduce stranded assets. However, given the preponderance of delivered fuels in Vermont, it is somewhat understandable that Vermont's focus is not yet distinctly homed in on gas system planning.

MassDEP does not identify gas system programs and policies currently underway, such as the Gas System Enhancement Plan, nor the need for coordinated, long-term planning across intersecting policies. This may not be surprising, given MassDEP's particular role, and the focus

¹⁷³ Proceeding No. 23M-0234G. <https://puc.colorado.gov> and https://www.dora.state.co.us/pls/efi/EFI_Search_UI.search

¹⁷⁴ Woodruff, C. Bill mean to curb utility-bill volatility awaits Colorado governor's signature. May 9, 2023. Colorado Newswire. <https://coloradonewswire.com/briefs/utility-bill-volatility-colorado-governor/>

¹⁷⁵ Sealover, E. After changes, businesses and legislators laud bills that could affect utility rates. The Sum & Substance: What Matters to Colorado Business. <https://tsscolorado.com/after-changes-businesses-and-legislators-laud-bills-that-could-affect-utility-rates/>

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on a streamlined, simplified version of a CHS. However, in December of 2023, the Massachusetts Department of Public Utilities released an Order in Docket 20-80-B, which focused on the role of gas utilities as the Commonwealth plans to achieve its overarching climate target of net zero emissions by 2050. This Order included various findings such as affirming that the Commonwealth’s primary building decarbonization strategy is electrification, that building decarbonization will require coordinated planning between gas and electric utilities, highlighting concerns regarding the future potential role for RNG and hydrogen, clarifying that the gas system will largely be assumed to be decommissioned (with the exception of hard-to-decarbonize applications such as process heat applications for some commercial and industrial customers, requiring gas utilities to consider alternatives to gas pipelines, reviewing the role of performance-based ratemaking including the development of “climate compliance performance metrics,” and suggesting that further customer expansion of the gas system be disincentivized.¹⁷⁶ Thus, it appears there will be significant focus on coordinated, strategic gas system decommissioning.

MDE’s December 2023 Climate Plan also highlights progress in gas system planning, stating that, respecting the Public Service Commission’s “status as an independent state agency, MDE supports the call for PSC to oversee the development and implementation of gas system planning to achieve a structured transition to a net-zero emissions economy in Maryland.”¹⁷⁷

5.2 Equitable rate design that supports decarbonization policy

Regulators, along with other policy makers and stakeholders, will need to monitor the potential impact of the CHS on LMI populations. While a CHS can include some mechanisms to address energy burden (described in Section 4.9), other activities will be needed to address increasing cost for fossil heat (and, over time, efficient electric heat and associated increased costs related to storage, distribution, transmission and new renewables). Examples include reassessing electric rate design for efficiently electrified homes and consideration of low income rates for

¹⁷⁶ <https://acadiacenter.org/acadia-center-applauds-the-massachusetts-d-p-u-for-a-groundbreaking-science-backed-gas-utility-transition-order/>

¹⁷⁷ Maryland’s Climate Pollution Reduction Plan: Policies to Reduce Statewide Greenhouse Gas Emissions 60% by 2031 and Create a Path to Net-Zero by 2045. December 28, 2023. P. 41.
<https://mde.maryland.gov/programs/air/ClimateChange/Maryland%20Climate%20Reduction%20Plan/Maryland%27s%20Climate%20Pollution%20Reduction%20Plan%20-%20Final%20-%20Dec%2028%202023.pdf>

gas-heated homes. Currently, none of the four reviewed states have included the concept of revisiting rate design to address energy burden and income equity considerations.

Recommendations:

- CHS statute can call out the need for stakeholders, at some future point in time, to open a proceeding to address rate design from a holistic, comprehensive approach that considers the balancing act underway as thermal energy consumption shifts from gas (and reduced consumption so fewer bill payers) to electricity (with increased consumption and more bill payers).

Field Applications

Currently, none of the four reviewed states have included the concept of revisiting rate design to address energy burden and income equity considerations within their respective CHS deliberations. However, as presented in Section 4.9, these states are actively incorporating policy design elements to address equity concerns. Additionally, discussions are occurring about the need for rate design that protects lower income residents, although not necessarily within the CHS program structure.

5.3 Ensuring efficient equipment installations and ongoing electric sector decarbonization

Earlier, it was recommended not to require a threshold of efficiency for electric measures, and not to include electricity providers in the CHS. This recommendation relies on the presence of other, complementary policies. These can include but are not limited to energy efficiency requirements, building performance standards, appliance efficiency standards, efficient building energy codes, rental efficiency ordinances, renewable portfolio standards, and clean energy and clean peak standards.

Recommendations:

- Policies that drive investment in efficiency, renewables and storage are critical to ensure that a CHS is implemented in a fashion that reduces as much emissions as cost-effectively as possible.
- Coordination across policies should be purposely addressed and required to ensure efficient and coordinated use of energy, labor and financial resources.

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Field Applications

Colorado’s statute and regulations do not articulate the need for a connection to other efficiency and clean energy policies. However, as discussed earlier, there are multiple proceedings underway, including an overarching “Strategic Issues” proceeding that is to reinstate soon.

In Vermont (and described earlier in Section 4.8.1), the TAG is expressly mandated to facilitate the CHS “program’s coordination with other energy programs.”¹⁷⁸

MassDEP is clearly already considering the need for policy coordination, having devoted an entire section to their Stakeholder Discussion Document entitled “Interactions with Other Programs.” This section mentions Massachusetts’ Clean Energy Standard, and its “detailed requirements designed to ensure that the stringency, eligible technologies, and reporting requirements are compatible with other Massachusetts energy policies.” MassDEP also states that “it will be particularly important to understand and address any interactions with the [Alternative Energy Portfolio Standard] program, which requires electric energy suppliers to hold compliance credits (certificates) representing clean heat.”¹⁷⁹

Maryland’s December 2023 Climate Plan illustrates – throughout the plan – how policy makers plan to continue to support efficient equipment and ongoing electric sector decarbonization. Thus, there are varying degrees of stated and intentionally-planned coordination across the various jurisdictions.

5.4 Workforce needs and opportunities

As has been highlighted in numerous sectors, there are significant workforce shortages across multiple industries. Thus, any policy (such as a CHS) that requires substantial deployment of equipment and services will also require complementary policies to grow and support the necessary workforce. Historically, America’s approach to labor challenges has operated in an environment whereby employers could pick and choose employees. America’s lack of a working immigration policy, combined with the retirements of millions of baby boomers and a declining birth rate has changed this dynamic. Currently, it is generally the employee who can pick and

¹⁷⁸ 30 V.S.A. §8128(a)(6).

¹⁷⁹ MassDEP Stakeholder Discussion Document. Clean Heat Standard Program Design. March 2023. P. 9. <https://www.mass.gov/doc/clean-heat-standard-discussion-document/download>

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choose the employer. Thus, workforce policy needs to shift focus. To be competitive, each industry needs to highlight the unique and favorable characteristics of the jobs and career pathways available to potential employees, in order to remain competitive with other sectors. Meanwhile, employers need support to rethink how to recruit, train and reskill, and retain valuable workers. In sum, a variety of workforce policies and programs (e.g. education and outreach, reskilling, modifications of certifications and specialty licenses) should be developed to ensure that workers are available to implement a CHS. Ultimately, the best designed CHS will not achieve the emissions reductions targets if there is not the human power to deliver it.

Recommendations:

- Recognize that workforce challenges are real and will take time to address.
- Ensure that there are other policies in place – and entities capable of implementing said policies – to (a) develop and implement a workforce development plan; (b) coordinate implementation across multiple market actors, and (c) track performance and modify plan and approach, if needed.

Field Applications

Colorado’s statute actually collars workforce development: “For any utility-owned project that is part of a clean heat plan, the gas distribution utility shall, where practicable, use its own employees to complete the work.”¹⁸⁰ However, the statute also states that “in all decisions approving clean heat resources to be acquired as part of a clean heat plan, the Commission shall consider the long-term impacts on Colorado’s utility workforce as part of a just transition and shall give additional weight to a project that includes...training programs...employment of Colorado-based labor...and long-term career opportunities and industry-standard wages, health care and pension benefits.”¹⁸¹ Colorado statute also requires the meeting of various labor standards and reporting requirements. This statute presents a mix of policy considerations. It reflects a level of protectionism for Colorado-based labor while also ensuring that workers are paid appropriately with additional benefits provided. With regards to the need for a more comprehensive workforce policy, it only briefly mentions the need for new opportunities via training opportunities and the concept of “long-term career opportunities.” However, there may be other policies that support the necessary workforce to reach clean heat targets.

¹⁸⁰ §40-3.2-108.(8)(a), C.R.S.

¹⁸¹ §40-3.2-108.(8)(d)(I-III), C.R.S.

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Vermont’s statute requires reporting on the impacts of the CHS on employment and a potential study including “an assessment of workforce characteristics capable of meeting consumer demand and meeting the obligations” of the GWSA.”¹⁸² Outside of Vermont’s Affordable Heat Act statute, a number of initiatives are underway to address the acute workforce shortages and needs in the skilled trades and energy industry. These include an upcoming “Talent Pipeline Management” process, to work with HVAC and weatherization businesses to identify and address critical workforce challenges, a comprehensive initiative to develop a sustainable business plan for a statewide “Weatherization Training Workforce Center,” funding provided by the legislature to provide coaching to energy service businesses to transition and grow their companies, and other efforts spearheaded by the Vermont Climate Workforce Coalition.¹⁸³ While Vermont has significant progress to make to ensure that CHS targets are met, there are a number of promising, coordinated policies and programs currently underway.

CHS documentation in Massachusetts is essentially limited to a handful of materials: the March 2023 Stakeholder Discussion Document, Draft Regulations regarding Emissions Reporting Requirements for Heating Fuel Suppliers, compilations of stakeholder comments, updated materials for stakeholder review released in November of 2023, and a few PowerPoints. While there is one question that asks: “How could economic benefits be quantified, such as the macroeconomic benefit to Massachusetts of substituting spending on local heat pump contractors for spending on imported fossil fuels?,” there is little else currently available that discusses the role of workforce and the need for coordinating labor policies and programs. Again, as future documentation and decisions are released by MassDEP, this could change.

Maryland’s December 2023 Climate Plan mentions the need to focus on and support clean energy jobs and workforce development, including initiatives by the Maryland Department of Commerce’s Office of Strategic Industries and Entrepreneurship, the PSC, the Department of Labor and the Department of Service and Civic Innovation.¹⁸⁴ While workforce is not mentioned in the CHS section of the Plan, it appears that there is support and coordination in ensuring this complementary policy support occurs.

¹⁸² 30 V.S.A. Chapter 94. §8125(e)(1)(a).

¹⁸³ <https://www.eanvt.org/network-action-teams/climate-workforce/>

¹⁸⁴ Maryland’s Climate Pollution Reduction Plan: Policies to Reduce Statewide Greenhouse Gas Emissions 60% by 2031 and Create a Path to Net-Zero by 2045. December 28, 2023. P. 75 – 76.

<https://mde.maryland.gov/programs/air/ClimateChange/Maryland%20Climate%20Reduction%20Plan/Maryland%27s%20Climate%20Pollution%20Reduction%20Plan%20-%20Final%20-%20Dec%2028%202023.pdf>

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6. Appendices

6.1 Comparing systems in Vermont: credit-based vs. allowance-based

As mentioned in Section 3.2, a CHS can be considered a “bottom up” approach to reducing thermal emissions, in comparison to a “top-down” approach like a cap-and-allowance/trade/invest system. There are advantages and disadvantages to both. Table 5 below, copied verbatim from Cowart and Neme’s “The Clean Heat Standard,” provides further comparison between these two approaches, as they could apply in the state of Vermont.¹⁸⁵

Table 5. Comparison of a Credit vs. Cap-and-Allowance System (copied verbatim)

Program Elements and Functions	Credit System – requires addition of clean heat	Cap and Allowance System – requires reductions in fossil heat
Standard	Specified level of GHG emissions avoided by qualified actions	Specified level of remaining GHG emissions (i.e., a cap)
Mechanism	<ul style="list-style-type: none"> Relies on performance obligation to drive change Credits are earned representing GHG emissions avoided. 	<ul style="list-style-type: none"> Relies on allowance prices to drive change Permits (allowances) to emit GHGs (the right to pollute) Allowances can be either auctioned off or allocated/assigned for free
Governance	<ul style="list-style-type: none"> Targets set by the legislature Obligated parties responsible for acquiring sufficient emission reduction credits. Oversight of compliance by PUC/PSD and ANR 	<ul style="list-style-type: none"> Cap set by the legislature Obligated parties must have allowances to cover their emissions or sales. PUC/PSD/ANR to manage any auction of allowances and use of revenue from auction. Oversight of compliance by PUC/PSD and ANR
Emission reduction measures	The range of emission reduction measures for which credits are assigned can be established at a high level through statute and refined through a technical process overseen by regulators.	Because achievement of the obligation is determined by actual remaining emission levels, there is no need to specify which measures can be used.
Credit values of different clean heat measures	<ul style="list-style-type: none"> A technical process, involving relevant stakeholders, establishes the number of annual emission reduction “credits” assigned to types of measures, the number of years for which they are 	<ul style="list-style-type: none"> For most measures there is no need to assign emission reduction values because compliance with obligation is based on the actual amount of remaining emissions.

¹⁸⁵ Cowart, R., Neme, C. “The Clean Heat Standard.” An Energy Action Network White Paper. December 2021. Appendix 2. Section A. Table copied verbatim.

	<p>assigned, and any degradation of credit values over time.</p> <ul style="list-style-type: none"> • Credit values for common measures are deemed averages that are regularly updated based on technical data and on-going evaluation. • Process and methods for determining savings from larger, unique projects would be established. • The PUC approves (and resolves any disputes) over measure values. 	<ul style="list-style-type: none"> • One exception is for biofuels and/or any other emissions offsets that are allowed. For such measures a technical process and regulatory approval is still required to assign emission reduction values (e.g., combustion of renewable methane produces as much direct CO2 emissions as combustion of fossil methane – the difference is that emissions from renewable methane are assumed to be at least partly offset by other reductions in greenhouse gas emissions).
Delivery of Emission Reductions	<ul style="list-style-type: none"> • Obligated parties can either run programs to acquire credits themselves, contract such programs to other entities, or buy credits from other entities. System can also include option to assign obligation to a “default provider” (along with funds necessary for that provider to acquire reductions). 	<ul style="list-style-type: none"> • Obligated parties can simply reduce sales, or could pay to purchase emission allowances. • Obligated parties could diversify and run programs to reduce emissions, but are not obliged to do so. • If allowances are auctioned, revenues from auction can be invested by the state in programs to reduce emissions. Some measures could have value beyond GHG reductions (e.g., weatherization of homes).
Role of the Market	<ul style="list-style-type: none"> • Vendors, contractors or other entities that produce or install any measure for which credits can be assigned can sell the GHG reduction attributes of their products or services. 	<ul style="list-style-type: none"> • Market price of allowances is the main driver of change • Obligated entities have some incentive to support markets for products and services that reduce emissions and allowance prices. However, such products and services do not have any saleable market value.
Determination of Compliance	<ul style="list-style-type: none"> • Obligated entities must demonstrate they have acquired enough credits. • As long as obligated entities have legitimately acquired credits that are properly valued, they are in compliance. • Regulatory oversight to ensure credits are legitimate and properly valued. 	<ul style="list-style-type: none"> • Obligated parties must demonstrate that their actual emissions were no greater than the number of emission allowances they own. • Obligated parties bear risk of non-compliance if they deliver more fuel than their owned allowances permit. • Regulatory process to confirm compliance.
Addressing Equity Concerns	<ul style="list-style-type: none"> • Can create “carve out” for low income customers – e.g., minimum percent of weatherization or fuel-switching measures required to be for low income households. • Other complementary policies – gas rate design, rental efficiency requirements, bill payment support, etc. – could also be used. 	<ul style="list-style-type: none"> • Relying on higher fuel prices to drive change will raise heat costs for everyone. • Requires complementary policies – gas rate design, low income weatherization increases, rental efficiency requirements, bill payment support, etc.

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6.2 Overview of Heating Technologies that are Cleaner than Conventional Fossil Fuel Technologies

Copied verbatim from: “A Clean Heat Standard for Massachusetts.” Appendices to the Massachusetts Clean Energy and Climate Plan for 2025 and 2030. Appendix B. P. 60 – 61. Written by Regulatory Assistance Project for the Commonwealth of Massachusetts. July 2022. <https://www.mass.gov/doc/appendices-to-the-clean-energy-and-climate-plan-for-2025-and-2030/download>

“There are now a substantial number of heating technologies that are cleaner than fossil fuel technologies, with lower greenhouse gas emissions and no on-site combustion that affects indoor air quality or local air pollution. Chief among those are electric heating technologies, including:

- *Electric resistance: Running an electric current through metal can be used to heat air or water. This is a relatively inefficient technology for space heating but is a common water heating technology.*
- *Air-source heat pumps: Typically using an outdoor compressor and an indoor unit, an air-source heat pump uses the inherent energy in the outdoor air with a refrigerant to either heat or cool the indoor air. Ductless indoor units directly heat or cool the room where they are located, but indoor units can also be connected to air ducts to transport the conditioned air, like a traditional furnace. Both ductless and central air-source heat pumps also provide cooling in summer.*
- *Heat pump water heaters: This technology is similar to an air-source heat pump with a simpler, single-unit arrangement, but it directly heats water instead of air. There is no outdoor condenser, as these units take heat from the air in the space where they are located, often a basement or cool storage space.*
- *Geothermal heat pumps: Also known as ground-source heat pumps, these use the consistent temperature of the earth (instead of ambient air) to provide very efficient heat or cooling to a building through a heat exchanger using loops of refrigerant-filled pipe buried in the ground.*
- *Geothermal district energy, using heat pumps within buildings: This uses a system of ground-source heat pumps to serve multiple homes or businesses at a time.*

Other clean thermal supply alternatives:

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- *Solar thermal: Flat plates or evacuated tube collectors can be used to heat water, which can either be used for space heating or water heating.*
- *Clean district energy using zero-GHG inputs: This includes combined heat and power facilities that use renewable electricity sources to create steam, which can be distributed to heat one or more buildings.*

There are a range of other heating fuels (solids, liquid and gases) that are not derived from fossil fuels and may have the potential to provide clean heat in the Commonwealth of Massachusetts. Importantly, there are many variations in how these fuels are created, collected or combusted, which leads to different kinds of upstream and downstream environmental impacts. The primary alternatives for clean solid fuels are various forms of advanced wood heating, typically using wood pellets. Some sources of woody biomass could be considered to be zero- or low-GHG emission when evaluated on a life cycle basis – for example, if pellets are made from sawmill residue or other waste products. Newer combustion technologies for wood fuels are much cleaner and more efficient than those of the past. In addition, at least two different kinds of liquid fuels can substitute for fossil heating oil as a blend or sometimes as a full replacement:

- *Biodiesel: This can be derived from vegetable oils, soybeans or other food byproducts. Biodiesel can be used as a blend, but pure biodiesel is hard to store and may require modifications to typical heating equipment.*
- *Renewable diesel: Renewable diesel can be derived from the same feedstocks as biodiesel but is further refined into the same chemical form as fossil diesel fuel. As a result, renewable diesel can be used as a blend or a replacement for fossil heating oil.*

Potentially cleaner forms of gaseous fuels are:

- *Biomethane or renewable natural gas: There are several different collection sources for forms of methane that could be considered renewable. Potentially valuable sources include those that recapture methane that would otherwise be vented into the atmosphere. Those include collection at landfills, livestock operations, wastewater treatment plants and coal-mine mouths and anaerobic digestion, but not synthetic methane created from other fossil fuels. Most forms of biomethane contain contaminants that have health impacts and that interfere with combustion control technologies for reducing other pollutants, such as nitrogen oxides (NOx).*
- *Clean hydrogen: Today, nearly all hydrogen is created using steam-methane reforming, which typically has significant greenhouse gas emissions from the energy needed and the chemical process itself. This is known as gray hydrogen. However, green hydrogen, created from the electrolysis of a water molecule using zero-GHG electricity, has no GHG emissions associated directly with its production. Several other hydrogen creation methods are being*

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explored across the globe, and each has its unique features. Although many analysts support the use of green hydrogen on a limited basis as a replacement for gray hydrogen and in high-temperature applications that are not easily electrified, a much wider use of hydrogen as a replacement for pipeline gas raises a number of issues. Hydrogen poses challenges for existing gas pipeline infrastructure because of its chemical and physical properties, and substantial investments to carry significant percentages of hydrogen would be needed. Combustion of hydrogen can also have significant nitrogen oxide emissions.”

The authors of this paper note that Environmental Defense Fund has issued various documents regarding biomethane. These include:

- Alvarez, Ramón A., Daniel Zavala-Araiza, David R. Lyon, David T. Allen, Zachary R. Barkley, Adam R. Brandt, Kenneth J. Davis, Scott C. Herndon, Daniel J. Jacob, Anna Karion, Eric A. Kort, Brian K. Lamb, Thomas Lauvaux, Joannes D. Maasackers, Anthony J. Marchese, Mark Omara, Stephen W. Pacala, Jeff Peischl, Allen L. Robinson, Paul B. Shepson, Colm Sweeney, Amy Townsend-Small, Steven C. Wofsy and Steven P. Hamburg (2018). “Assessment of methane emissions from the U.S. oil and gas supply chain,” *Science* 361, Issue 6398, 186 – 188.
<https://www.science.org/doi/10.1126/science.aar7204>
- Rudek, Joe and Stefan Schwietzke, “Not all biogas is created equal,” April 15, 2019.
<https://blogs.edf.org/energyexchange/2019/04/15/not-all-biogas-is-created-equal/>.
- Omara, Mark and Joe Rudek, “Careful accounting is critical to assessing the climate benefits of biomethane,” March 24, 2021.
<https://blogs.edf.org/energyexchange/2021/03/24/careful-accounting-is-critical-to-assessing-the-climate-benefits-of-biomethane/>.