Clean Heat Standard -- Appendices

(to Review Draft 4 – October 20 2021)

Appendix 1. Policy Choices for Clean Heat – Why We Recommend a Clean Heat Performance Standard

A Clean Heat Standard is by no means the only policy option available to reduce thermal consumption and GHG emissions. We have considered several other options including, among others: carbon pricing, thermal energy efficiency programs, building codes, and heating equipment appliance standards. All of these approaches have some merit, and any or all of them could be adopted to work in tandem with a Clean Heat Standard. To the degree that any of these parallel strategies lowers demand for fossil heat, or lowers the cost of delivering clean heat solutions, they only make it easier to deliver cleaner fuels and heating conversions, speeding up the transition to clean heat in Vermont.

However, we conclude that none of these other options is likely to succeed on its own, and none would be as singularly effective as a Clean Heat Standard in delivering tangible progress. Reasons for this conclusion are set out below.

Why carbon pricing alone will not do enough

While many analysts have suggested that putting a price on carbon could be the driver for clean heat, there is strong evidence that pricing carbon, by itself, would not drive down fossil heat emissions meaningfully unless it were set at unrealistically high rates. Looking at consumption data over many decades, economists conclude that demand for heating fuels is strongly inelastic – that is, consumption changes very little in relation to the price of fuel. In a study for the legislature in 2019, following extensive economic modeling, *Resources for the Future found that even if carbon prices were set as high as $100 per ton, the achieved reduction in carbon emissions statewide would be only about 10% below the expected business as usual case.* RFF concluded:

> "Our results indicate that both the environmental and economic impacts of carbon pricing policies alone are likely to be relatively small….Due to the concentration of Vermont's emissions in transportation and heating, moderate pricing alone is unlikely to produce the large reductions in GHG emissions that would be needed to meet Vermont's emissions targets. Historically, transportation and heating fuel uses are relatively insensitive to changes in fuel prices and therefore we project relatively small emissions reductions in these sectors."[1]

Vermonters know the truth of this conclusion from our own experience, having lived through very large swings in the prices of fossil fuels in recent years, with very little impact on overall fossil fuel demand.

Why thermal efficiency programs can't do enough

Vermont has long been a leader in promoting energy efficiency, including building weatherization, and has recently expanded programs in this area through Tier 3, a carbon reduction program supported by electric utility revenues. These programs are essential, and should be dramatically expanded.

[1] Resources for the Future, "Analysis of Decarbonization Methods in Vermont" (2019) Executive Summary at p.2. While carbon prices alone are a weak tool to drive emission reductions in the thermal sector, carbon pricing (either via a carbon tax or a cap-and-trade program) can accelerate emission reductions if carbon revenues are devoted strategically in ways that help end users to save energy and convert to cleaner fuels. See section IV(1)(A) below.

Weatherization at Scale, an initiative being developed in concert with the Clean Heat Standard, should be implemented alongside this Clean Heat proposal. Thermal efficiency and clean heat work together like two blades of a scissors to cut fossil heat pollution.

However, as a very practical matter, thermal efficiency does not eliminate the need for a clean heat program. Weatherization experts agree that thermal retrofits – even so-called "deep retrofits" – can be counted on to reduce the heat load of Vermont buildings by just 20 to 30%. The large majority of the heat load in most buildings will still need to be met through thermal inputs of some kind. To meet our climate goals, those inputs will need to come from low-emission sources, those that would be promoted by a Clean Heat Standard.

Why building codes will not do enough

Every building built today is likely to be in operation for 75 to 100 years. It is possible to build new structures to a very high standards delivering near-zero or net-zero emissions. There are important reasons to improve building codes in Vermont so that new buildings are much more efficient, healthier, and less polluting that historic buildings have been. But building codes could not come close to addressing the climate challenge posed by the existing building stock. Vermont has among the oldest building stock in the nation, and the replacement rate in that stock is less than one percent per year. The rate of new additions is also low, in recent years less than 2/10ths of 1% per year. The vast majority of the buildings that will be in service in 2050 are already built and not likely to be replaced any time soon.[2]

Why equipment standards are not enough

In contrast to the building stock, the heating equipment in buildings tends to have much shorter life-spans. The life of an average oil furnace in Vermont is 20-25 years, for example.[3] Unfortunately, most heating appliances, including hot water heaters, are replaced only on an emergency basis when they fail. As a result, owners rarely have the time or inclination to switch to an entirely new system, even one that would be less polluting and less expensive to run in the long term. For these reasons, many experts have advocated for raising the minimum performance standards for heating appliances so that the choices available at the time of sale are altogether more efficient.

However efficient new heating appliance standards might be, it is not likely in the near term (i.e. before 2025) that Vermont would enact an equipment standard that would ban the sale of fossil heating equipment altogether – for example, to forbid a building owner from replacing a failed oil furnace with a like-kind unit. Partly, this is because fuel oil equipment can be run on B100 biodiesel and natural gas equipment can be run on increasing shares of renewable natural gas. That said, the same is not true for propane, for which there is not currently available a no- or low-carbon fuel alternative (which means propane equipment may need to be a particular focus of equipment standards). Even if equipment standards could forbid fossil heating equipment replacements going forward, it would be better to avoid the small crises that occur when units fail. It would be preferable to enlist the expertise of furnace technicians to warn customers that their unit will soon be at the end of its life and to offer advice on

[2] VHFA, Vermont Housing Needs Assessment (February 2020). For this reason, reducing heat from buildings is even more difficult than reducing emissions from vehicles. The vehicle fleet turns over much more quickly than the housing stock, and vehicle emissions can be addressed by a few manufacturers, not hundreds of thousands of individual homeowners.

[3] However, most furnaces and gas boilers are connected to a network of pipes or ducts that lasts much longer and is more complicated and more expensive to re-engineer when a heating system is changed.

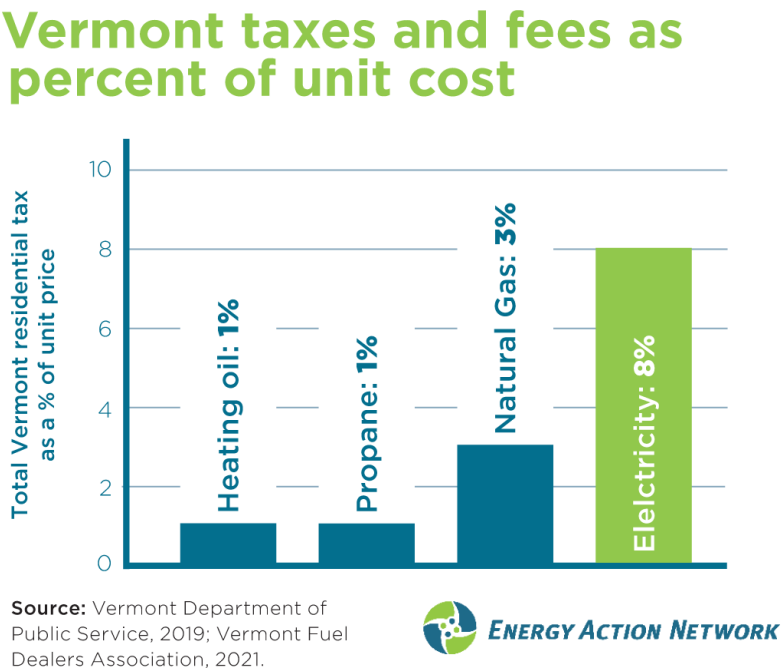
how to install a clean heat alternative, rather than just waiting until the unit fails. A Clean Heat Standard would create and support this proactive approach.

Why simply expanding Tier 3 is not the best answer

Vermont is among a handful of states that have gotten a start on thermal efficiency and clean heat installations by extending utility energy efficiency or renewable energy programs. Vermont electric utilities are obliged to deliver fossil energy reductions through an added requirement, called Tier 3, to the Renewable Energy Standard. Under the Tier 3 program, electric utilities have delivered thermal efficiency, heat pumps, and advanced wood heat installations, and a variety of other fossil avoidance solutions including electric vehicle measures, load control programs, and less carbon-intensive industrial equipment. Creative solutions have included line extensions to deliver power to displace fossil fuels in such facilities as sawmills, gravel pits, and sugar houses.

Based on the statutory schedule of increasing targets and the mix of strategies and measures recently deployed by Green Mountain Power to meet its 2020 obligation, we estimate that Tier 3 will result in approximately a 7% reduction in Vermont's thermal sector emissions by 2030. While much more will obviously be needed, that represents an important and good start towards achieving the 40% reduction that the state needs by 2030. Based on the electric utility experience to date, one possible approach to clean heat in Vermont might be "just make the electric utilities do it." Put simply, the state could just increase the magnitude of the Tier 3 requirements by a factor of five or six. We do not believe this is the best answer, for three reasons.

First, electric utilities and electric rates are already bearing most of the cost of addressing climate change in energy in Vermont. Electric rates have supported renewables additions, grid upgrades, and electric efficiency programs. Carbon costs are reflected to some degree in power costs through the Regional Greenhouse Gas Initiative. In contrast, aside from VGS, fossil heat companies pay very little for energy efficiency; they face no renewables mandates; and have no carbon reduction requirements. As a result, progress has been very slow in the thermal sector, and we have created a situation in which the cleanest energy source (electricity) is paying extra costs to address climate change, while the higher-emitting fossil fuels are paying very little. (See Figure 4 below)



Appendix Figure 1. Vermont taxes and fees as a percent of heating fuels costs

The resulting price distortion is sending the wrong price signals to consumers and making it that much harder to clean up our energy mix. Putting a clean heat obligation on fossil providers is appropriate on

the merits and it also helps to rebalance the scales with respect to sharing the costs of the energy transition.

Second, a diversity of approaches is important to success in the needed transition. We can expect that fuel dealers, electric companies, and a pipeline gas company will take different approaches to the solutions offered to customers and how they will be marketed. We don't know in advance, but it's likely that electric utilities will favor heat pumps, while fuel dealers may favor biofuels and delivery of wood pellets, and VGS might focus its efforts on renewable methane and district heating. In the short run, Vermont may need all of these solutions to meet our climate goals, and in the long run we may need them to navigate and manage power peaks and outages, renewable gas price hikes, or other supply disruptions. Choice is also important to consumers due to personal preferences and the nature of the building stock.

Third, as noted above, the thermal transition requires a workforce of customer-facing installers and experts who can help customers to change over heating systems to low-emitting equipment. Vermont's fuel dealers have those relationships and have the opportunity to build on them to evolve new business models for their companies. Simply mandating a huge expansion of the electric utility Tier 3 program would not give these companies the incentive to retarget their businesses for the future.

Appendix 2. Key Design Recommendations

Notes on Section A. Nature of the Obligation

1. Clean Heat Credits

As noted in the body of this paper, designing a market-based program to ensure specific levels of reductions in fossil emissions in Vermont begins with a choice between two systems: (a) a system that requires fossil providers to earn *credits for positive actions* (e.g., selling renewable fuels or installing heat pumps) or (b) one that *reduces emissions under a declining cap* and distributes those emission allowances among fuel sellers by auction or some other means. The credit-based system is more akin to the systems Vermont has used for Renewable Portfolio Standards and Efficiency Obligations. The cap-and-allowance system is more akin to the method used in the Regional Greenhouse Gas Initiative and in the proposed Transportation Climate Initiative. The characteristics of these choices are set out in the chart below. Note that modifications are possible and hybrid solutions can be also designed.

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	• Relies on performance obligation to drive change • Credits are earned representing GHG emissions avoided.	• 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	• Targets set by the legislature • Obligated parties responsible for acquiring sufficient emission reduction credits. • Oversight of compliance by PUC/PSD and ANR	• 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	• A technical process, involving relevant stakeholders, establishes the number of annual emission reduction "credits" assigned to types of measures and the number of years for which they are assigned. • 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.	• 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. • 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	• 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).	• 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	• 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.	• 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	• 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.	• 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	• Can create "carve out" for low income customers – e.g., minimum percent of	• Relying on higher fuel prices to drive change will raise heat costs for everyone.

	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.	• Requires complementary policies – gas rate design, low income weatherization increases, rental efficiency requirements, bill payment support, etc.

Each of these approaches has pros and cons. One advantage of the credit system is that it creates a commercial value for each heat pump, wood pellet stove, home weatherization job, gallon of biofuel and other measures. That, in turn, could help fuel dealers, contractors, farmers and others to transition their businesses to selling such products and services. Another advantage of the credit system is that it reduces uncertainty for the obligated parties (Vermont Gas and the suppliers of delivered fuels) regarding what they need to do each year to meet their obligations. Each entity knows at the beginning of each year how many total credits they need to acquire and how much each type of common emission reduction measure is worth. In contrast, under the allowance system, where fossil heat suppliers commit to provide their customers with uninterrupted supplies through the heating season, they may not know what their total sales will be until the end of the year. If demand is greater than expected because of colder weather, increased economic activity or other reasons, their plans for acquiring allowances or reducing emissions may be inadequate.

On the other hand, the cap-and-allowance system provides greater certainty that the state's desired emission reductions will be achieved. Because of on-going evaluation and recalibration of emission reduction values assigned to different measures via the pre-existing technical resource manuals produced for efficiency measures and Tier 3 fossil fuel reduction measures, the difference between state goals and emission reductions achieved under a credit system is likely to be small. However, there may still be some difference. Another related advantage of the allowance system is that it may be administratively simpler to implement – primarily because it eliminates the need for a process to assign values to some emission reduction measures. However, that may be only a small advantage. There will still be a need for a value determination process for biofuels. Also, while there is no need to assign a value to heat pumps, wood pellet stoves, weatherization of homes, and other measures, there will still likely be a need to analyze the magnitude of emission reductions such measures provide so that obligated parties can effectively plan to for how they will reduce emissions enough to stay within their allowance limits.

The main advantage of a credit system over an allowance system is that it focuses on the delivery of concrete, delivered clean solutions rather than on allowance limitations and pricing as a tool to drive down consumption of fossil fuels. A carbon cap on heating fuels is intended to incentivize change through higher prices on fossil heat, which is an ineffective way to drive change in the buildings sector. The credit system, on the other hand, aims to assist customers to improve buildings and heating systems by measuring clean heat additions. In addition, a key goal of the CHS is to stimulate Vermont-based suppliers to deliver clean heat solutions to Vermont customers. This connection is stronger in a credit-based system.

On the whole, we conclude that advantages of the credit system – direct consumer benefits, greater support to Vermont businesses to sell clean heat products and services, and the greater planning certainty for obligated parties – outweigh the greater emissions certainty offered by the cap-and-allowance system. While a legitimate argument could be made for either approach, we conclude that the credit-based Clean Heat approach is preferable.

2. Credits Expressed in CO2e

The direct GHG emissions from Vermont's thermal sector are primarily in the form of carbon dioxide (CO2). However, if biofuels are to be an allowable measure for reducing emissions, one needs to account for the entire lifecycle impacts of all greenhouse gas emissions associated with their production, distribution, and combustion. For example, the direct CO2 emissions from burning a million BTUs of methane are the same regardless of whether the methane is a fossil fuel or was captured from a dairy farm. The latter is better for the global climate because the CO2 emissions from its combustion are offset by a reduction in methane emissions that would otherwise result from just letting cow manure biodegrade. Accounting for such biofuel tradeoffs requires expressing credits in terms of carbon dioxide equivalents (CO2e).

3. Credits Expressed in Terms of On-Site Emission Reductions

The current Vermont Greenhouse Gas Emissions Inventory measures emissions at the point of combustion of fossil fuels. That is the simplest way to measure both baseline emissions and future emission reductions.

But what about upstream emissions associated with existing consumption? Note that a ton of CO2 emission reduction from a gas furnace or boiler can be presumed to come with some "upstream" emission reductions (e.g., a reduction in emission leaks in the Vermont Gas distribution system and fugitive methane emissions from fracking and/or other methods used to produce natural gas). This is the case even if we are not "counting" such upstream GHG reductions. Put another way, a requirement to reduce CO2 emissions from combustion of fossil methane by 40% will also produce a 40% reduction in lifecycle CO2e emissions associated with fossil methane combustion. The same is true for all other fossil fuels for which there are also GHG emissions associated with production and delivery to homes and businesses. Thus, as long as both the *baseline emissions* from which reduction goals are measured and the *credits for reductions* are measured the same way, the total GHG reductions for any single type of fossil fuel will be the same whether goals and credits are expressed solely in terms of on-site emission reductions or lifecycle emission reductions.

The only potentially adverse effect of basing emission reduction goals and clean heat credits solely on on-site emissions is that differences between different types of fossil fuels in ratios of lifecycle to on-site emissions are not addressed. For example, if the CO2e emissions from a million BTUs from fossil fuel "X" were 10% less than for fossil fuel "Y" at the point of combustion but 20% more when considering full lifecycle emissions, a market based system for clean heat credits that is based on on-site emissions will place greater value on reductions of fossil fuel Y when the reductions from fossil fuel X would be more valuable from a lifecycle basis. However, we would expect most obligated parties to focus primarily on emission reductions associated with their own fuels, so the potential adverse effect of not accounting for differences in the ratio of lifecycle to on-site emissions is likely to be small and offset by the benefit of simplicity.

4. Attribution Not Required

The Vermont GWSA requires specific levels of emission reduction by 2025, 2030 and 2050. A Clean Heat Standard is simply a policy tool for ensuring that those reductions are achieved in Vermont's thermal sector. Thus, what matters is whether emissions actually go down and the correct number of clean heat

credits have been generated. It does not matter who generates those credits or why they were generated. If many of the credits would have been generated through natural evolution of the market (e.g., customers buying heat pumps or weatherizing homes on their own, without any programmatic inducement), that would simply mean that the level of effort required by obligated parties to acquire the right number of credits – and cost they would need to incur to do so – will be lower than if natural market forces would not produce much change on their own.

This is akin to how Vermont's current electric RES works. Electric utilities must simply show that a certain percent of their electric generation each year is from wind, solar and other renewable energy sources. It does not matter whether a customer would have put photovoltaic panels on their roof without a utility program or whether a wind turbine would have been built without any utility support. As long as the utility acquires the renewable attributes of such resources, they can use them to demonstrate compliance with their RES obligation.

In contrast, some programs do require obligated parties to prove that *their actions caused* the savings to occur. Vermont's energy efficiency goals and Tier 3 fossil fuel reduction goals require "attribution" – that is, only investments in efficiency or fossil fuel reductions *that were caused by programs run by the obligated parties* count towards the obligation. That is because the state's efficiency and Tier 3 goals were created to deliver savings beyond the levels that would have occurred naturally, rather than with statewide, bottom-line end points in mind. For example, Efficiency Vermont has been expected to improve the efficiency of electricity use in the state by about 2% per year relative to what it otherwise would have been. Conceptually, the state could have established an objective end it was trying to achieve – e.g., as a 20% absolute reduction in total electricity consumption by a date certain. If energy savings goals had been set that way, attribution would not be required because we would be assessing performance relative to that ultimate outcome. However, energy savings goals have not been set that way, largely because of uncertainty over how factors outside the control of Efficiency Vermont (e.g., economic growth, emergence of new energy consuming technology) could affect its ability to manage to such a goal. Instead, incremental annual goals are periodically established based on estimates of progress that can be cost-effectively achieved in the near term.[4]

The situation with GHG emission reductions – and the role of the Clean Heat Standard in driving reductions in the thermal sector – is fundamentally different. We know that the state – indeed, the world – needs to eliminate or largely eliminate GHG emissions by 2050 to stabilize the global climate. And Vermont's policy-makers have specified levels of progress towards that ultimate goal that need to be achieved by 2025 and 2030. That needs to happen regardless of levels of economic growth, demand for new energy consuming equipment, or any other factors that could affect energy consumption and emissions. In this context – where there are clearly defined ultimate outcomes that need to be achieved – attribution is not necessary. This approach ensures compliance with state policy goals and eliminates any need for complex studies (with results that are always at least somewhat uncertain) of who was responsible for a certain investment.

Additional note on biofuels

[4] In the case of Tier 3, the state was also just trying to make progress in reducing fossil fuel consumption rather than using Tier 3 to achieve the total reduction required to meet long-term climate goals. In that context, it also made sense to require attribution when determining whether Tier 3 reduction goals were met.

The requirement for VGS to acquire transmission capacity for physical delivery will provide an incremental incentive for biogas production that is in or relatively close to Vermont – as long as it is near to a gas pipeline that is connected to Vermont. Unbundled biogas – i.e., biogas produced and used in another state but for which VGS does not own transmission capacity necessary to bring it to Vermont – would not count as an eligible measure, even if VGS were to purchase its environmental attributes. That should change only if and when Vermont establishes a bilateral or multi-lateral relationship with another state or states with regards to trading of emissions credits.

Note that all biofuel purchases must be exclusively declared and retired in Vermont to avoid double-counting of their emission reduction attributes. Obligated parties retiring biofuel credits in Vermont should be required to register them in a broader registry if/when there is an appropriate mechanism for doing so. In the interim, they should at least attest that they are the sole and exclusive owner of all attributes of the fuel and that all such attributes are being retired.

Notes on Section F – Credit Values for Eligible Measures

1. Technical Advisory Group (TAG)

A Clean Heat Standard (CHS) Technical Advisory Group (TAG) would be akin to existing Technical Advisory Groups that have been created to (a) develop of energy savings assumptions for Vermont's efficiency utilities and (b) develop assumptions for fossil fuel reduction measures that Vermont's electric utilities employ to meet their RPS Tier 3 requirements. Indeed, the CHS TAG would be able to leverage the substantial work already done in Vermont to characterize efficiency measures and other fossil fuel reduction measures. In fact, it would be important that any underlying assumptions used for efficiency programs, electric RPS Tier 3 initiatives and the Clean Heat Standard be the same.

A modest addition to the state's technical staff (1 or 2 FTE at the DPS and PUC) would likely be required to administer the CHS, including the TAG process. Additional work would be required for the Clean Heat Standard, particularly converting existing assumptions on fossil fuel savings into emission reduction credits and developing assumptions for new measures, including biofuels, that have not yet been addressed by existing processes. However, Vermont is fortunate to have a substantial foundation on which to build. We already know how to do the technical work of counting and crediting savings in clean energy programs.

At a minimum, the CHS TAG should be comprised of representatives from the obligated parties, Efficiency Vermont, the Vermont Department of Public Service, and representatives of non-financially interested stakeholders. There may be value in formalizing the process by having the PUC appoint members to the TAG. There may also be value in the CHS TAG hiring an expert consultant to develop assumptions and lead the annual updating process. That consultant would take input from the members of the TAG and endeavor to reach consensus among TAG members on assumptions. However, the consultant would ultimately be responsible for putting forward proposed assumptions for regulatory

approval. This kind of process is current used in some other jurisdictions, including the state of Illinois for efficiency measure assumptions.[5]

2. "But for" Principle for Biofuels

As previously discussed, combustion of biofuels typically produces the same amount of CO2 emissions at point of combustion as combustion of the fossil fuels they are displacing. The difference is that the biofuels provide other GHG emission reduction benefits – either eliminating emissions of other GHGs and/or removing CO2 from the atmosphere before they are burned. Thus, CHS credits for biofuels need to be based on their net effect on GHG emissions. To estimate that net effect one must understand what GHG emissions would have occurred absent the substitution of the biofuel for fossil gas, fuel oil, propane or any other fossil fuel. That is the "but for" test.

For example, if a landfill is currently capturing and flaring (burning) methane, the GHG emission reductions associated with injecting the methane into a gas pipeline (rather than flaring it at the landfill) would be equal to the avoided CO2 emissions from the flaring. If a different landfill were simply venting methane rather than flaring it, the GHG emission reductions associated with injecting the methane into a gas pipeline would be the CO2e associated with eliminating the landfill methane emissions. If a third landfill was capturing its methane and burning it to produce electricity, the GHG emission reductions associated with instead injecting the methane into a gas pipeline would be the avoided CO2 emissions from the methane combustion at the landfill minus the increase in CO2 emissions on the electric grid from whatever alternative generation would likely be employed to replace the kWh it was producing.

One related aspect of the "but for" test is a determination of how existing or future government regulations would affect GHG emissions. For example, if a government regulation would require landfills of a certain size that are currently not capturing and flaring methane to begin to do so in three years, the GHG emission reductions that would be credited for capturing methane for injection into a gas pipeline will be different prior to the date the regulation goes into effect than after it goes into effect. The same would be true of regulations governing emissions from the agricultural, forestry and other sectors from which biofuels may be produced. This may be particularly important as Vermont and other states adopt climate policies for reducing GHG emissions from such sectors. If such policies are not considered in establishing the CHS credit values for biofuels, there will essentially be double-counting of emission reductions relative to state goals.

That said, it is important to recognize that biofuel projects may require multi-year commitments to make them economically viable. Thus, the uncertainty inherent in a system that initially gives full credit for reduced methane emissions from a farm that is currently unregulated, and then five years later de-rated the number of CHS credits earned from use of biofuels produced by that farm because of new regulations put in place after the project was developed, would create barriers to development of such projects. Thus, it may be appropriate to base biofuel credit values for specific biofuel projects with multi-year contracts – at least for an appropriately long duration (e.g., 10 years or 15 years) – solely on regulations in place or known to have been enacted but not yet in effect at the time a project begins production. Alternatively, the TAG could assign a degradation factor to certain types of biofuel projects to account for expected but unknown future regulations. Either approach would provide certainty

[5] Interestingly, the Vermont Energy Investment Corporation, the organization that runs Efficiency Vermont, is the technical consultant to the Illinois stakeholder process on annual updates to its efficiency Technical Reference Manual.

regarding the future value of biofuels projects that may be necessary to support investment in such projects.

3. Time-Stamping Credits

Some clean heat measures have a one-year life. For example, a gallon of biodiesel reduces GHG emissions only in the year in which it is burned. Other clean heat measures – such as heat pumps, wood pellet stoves and home weatherization projects – provide GHG emission reductions for 15 years, 20 years or even longer. The CHS needs to assign emission reduction credit values for these long-lived measures.

There are potentially two ways to do this. One is to credit a multi-year year measure its full lifetime emission reductions in the year it is installed. For example, if a heat pump had a 15-year life and produced 10 clean heat credits per year, one could assign 150 credits to that heat pump in year 1. In other words, a heat pump installed in 2024 would provide 150 credits towards an obligated party's 2024 credit obligation (but no credits in subsequent years). This is the approach currently used for determining compliance with Vermont's electric RPS Tier 3 requirements. The second option is to time-stamp a "multi-year strip" of credits that a multi-year measure earns. In this case, a heat pump installed in 2024 would earn 10 credits with a 2024 time stamp, another 10 credits with a 2025 time stamp, another 10 credits with a 2026 time stamp and so on through 2038 (the 15th year of its life).

The first option of capturing the lifetime emission reductions in the year a measure is installed is simpler and works well in the context of the electric utilities' electric RPS Tier 3 requirements. However, it is inconsistent with the GWSA's statutory requirements to achieve defined levels of GHG emission reductions in specific years. It would result in substantially lower levels of emission reductions in any given target year than required by Vermont's GWSA.

For example, consider a hypothetical situation in which obligated parties currently have 300 units of GHG emissions, and face the statutory objective of a 40% reduction in current emissions by 2030 (300 x 40% = 120 units of GHG reductions by 2030). Assume each heat pump produces 1 unit of GHG reduction per year, and each heat pump lasts 15 years.[6] As Table 1 below shows, if a heat pump's lifetime emissions reductions can all be claimed in the year heat pumps are installed, the obligated party would need to install only 36 heat pumps by 2030. The 36 heat pumps are expected to deliver 120 units of reduction eventually, but will deliver only 36 units of GHG reduction in 2030, or only a 12% reduction from current emissions – far short of the 40% required by statute. As Table 2 shows, to physically deliver 120 units of savings **in 2030,** 120 new heat pumps would have to be **in operation in 2030.** Thus, giving lifetime savings credits at the time of installation for savings that will only happen in the future is not consistent with the statutory goal of meeting emission reduction targets on time in the physical world. And continuing this form of accounting past 203 would only kick the can further down the road.

Table 1: GHG Emission Reductions if Lifetime Reductions Are Credited in the Year of Measure Installation

[6] These are simplifying assumption used for illustrative purposes only.

	2023	2024	2025	2026	2027	2028	2029	2030
2023 Program	15							
2024 Program		30						
2025 Program			45					
2026 Program				60				
2027 Program					75			
2028 Program						90		
2029 Program							105	
2030 Program								120
New HPs Installed In Year	1	2	3	4	5	6	7	8
Cumulative HPs Installed Since 2022	1	3	6	10	15	21	28	36
Credits Earned in Year	**15**	**30**	**45**	**60**	**75**	**90**	**105**	**120**
Actual Emission Reductions in Year	**1**	**3**	**6**	**10**	**15**	**21**	**28**	**36**
Actual GHG % Reduction	0.3%	1.0%	2.0%	3.3%	5.0%	7.0%	9.3%	12.0%

In these Tables credits given for new heat pumps are shown in yellow and time-stamped credits from heat pumps installed in previous years are shown in green. In Table 1, lifetime savings are pulled forward to the year of installation, and savings in 2030 are only 12% of the savings required. In Table 2, emission reductions from multi-year measures are credited only when they are delivered, and the statutory reduction target is met. In short, while time-stamping of credits for multi-year measures is a little more complicated, it is necessary to ensure that emission reduction targets will be met.

Table 2: GHG Emission Reductions if Annual Reductions are Credited in the Year They Are Delivered

	2023	2024	2025	2026	2027	2028	2029	2030
2023 Program	15	15	15	15	15	15	15	15
2024 Program		15	15	15	15	15	15	15
2025 Program			15	15	15	15	15	15
2026 Program				15	15	15	15	15
2027 Program					15	15	15	15
2028 Program						15	15	15
2029 Program							15	15
2030 Program								15
New HPs Installed In Year	15	15	15	15	15	15	15	15
Cumulative HPs Installed Since 2022	15	30	45	60	75	90	105	120
Credits Earned in Year	**15**	**30**	**45**	**60**	**75**	**90**	**105**	**120**
Actual Emission Reductions in Year	**15**	**30**	**45**	**60**	**75**	**90**	**105**	**120**
Actual GHG % Reduction	5%	10%	15%	20%	25%	30%	35%	40%

A final note on long-lived measures: when developing credit values for measures that last longer than one year – e.g., heat pumps, wood pellet stoves, and home weatherization – it will be also important to account for likely future interactive effects with other measures, which may well reduce the actual savings delivered by the earlier measures installed. [7] These interactive effects should not be seen as a

[7] Consider, for example, a heat pump that is installed in home in 2023, has a 15-year life, and reduces fuel oil consumption in the home from 600 gallons to 300 gallons in the first full year after it is installed. Because of increasing emission reduction requirements over time, by 2030 or even 2025 that home may be getting a portion of its heating fuel in the form of biodiesel instead of just fuel oil. Or the home may invest in upgrades to its attic insulation at some point over the 15-year life of the heat pump. In either case, in the heat pump will end up reducing fuel oil consumption in future years by less than 300 gallons.

reason to avoid long-lived measures. These are the kinds of adjustments often made by TAG-like technical groups.

Additional text on direct reductions:
A related point is that requiring direct reductions in emissions from Vermont homes and businesses also sends a signal that other sectors and other jurisdictions should also be expected to reduce their emissions. This is important because GHG emissions need to be dramatically reduced globally in order to stabilize the climate.

The recommendation to exclude reductions in methane leaks from the VGS system, storage facilities, and other upstream sources from the list of eligible measures ensures a focus on direct emissions from Vermont homes and businesses. Also, such reductions in leakage should arguably be addressed through other policies. If they were to be included in the Clean Heat Standard, then current methane leaks would need to also be part of the baseline emissions upon which VGS' emission reduction requirements were based.

Notes on Section G - Multiple Ways to Acquiring Credits

Discussion

1. Flexibility on Transaction Options for Acquiring Credits

Flexibility will be essential to minimizing the costs of compliance with the Clean Heat Standard. It may also be essential to enabling the standard to be met, as different obligated parties will have different levels of capacity and interest in the way credits are developed or acquired. The system should be open to at least five options, as shown on the schematic below:

Figure 10. Obligated parties can choose among multiple options to acquire CHS credits

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:
    - Some efficiency programs run by Efficiency Vermont and other efficiency utilities use their staff to work directly with customers to install measures;
    - In some electric utility RPS Tier 3 programs the utilities work directly with their customers to install electrification and/or weatherization measures;
    - Electric utilities can meet their RPS obligations by generating renewable electricity at their own facilities, purchasing renewables from other generators, or by working with

It would obviously be very challenging to address such interactions for each unique installation so the TAG will likely need to assign average expected degradation factors to long-lived clean heat measures.

end-use customers to install distributed renewables, such as PV systems, at customer locations.

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.

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.[8]

5. The final option would be assigning emission reduction obligations to a **"default delivery agent"** designated by the PUC. This would 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 through some combination of the first three options and/or does not want to deal with the risk of failing to meet its obligation. Of course, if an obligation is going to be assigned to a default delivery agent, the obligated party assigning its obligation must also provide the funding necessary for the default delivery agent to acquire the required number of credits. The level of funding should be established by the PUC and updated periodically to reflect changes in the cost of acquiring credits that could result as emission reduction requirements grow over time, as new technology emerges, as markets for clean heat products mature and/or for other reasons.

Regardless of which of these options or combinations of options are utilized, a mechanism would be needed to establish "ownership" of credits, both to create a strong credits market and to avoid double-counting (or double-selling of credits). This is not a new or onerous challenge. For example, it currently exists with regard to bidding of efficiency resources into the New England ISO's capacity market, and the attribution of renewable energy credits (RECs) to obligated parties throughout the New England states.

[8] 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.

2. Flexibility on Customers from Whom Credits Can be Acquired

Another potentially important aspect of flexibility is the ability of any obligated party to acquire clean heat credits for measures installed in *any* Vermont home or business. That would include customers who buy fossil fuels from other obligated parties – including customers who use different fuels than those sold by the obligated party. For example, a wholesale fuel oil company could acquire credits resulting from the installation of a heat pump in a home that buys fuel oil from a different wholesaler (or through a fuel dealer who buys its fuel oil from a different wholesaler). A fuel oil company could acquire credits resulting from the installation of a heat pump in a propane or fossil gas heated home.

This customer flexibility will serve several purposes. First, by broadening the range of options for obligated parties, it will create greater competition in the market and therefore lower the cost of compliance with the Clean Heat Standard. Second, it would create the potential for obligated parties to bundle sales of their fuel with other products and services as a way of more holistically meeting their customers' energy needs. Third, it will simplify tracking and verification of compliance by eliminating the need to determine whether a customer from whom credits were derived was a customer (directly or indirectly through a fuel dealer) of the obligated party. Fourth, it will make it easier for businesses selling clean heat products and services – e.g., HVAC contractors selling heat pumps, vendors of pellet stoves, and weatherization contractors – to find markets and the best prices for the credits they could generate. Fifth, it would allow for the potential for lower cost reductions in emissions from one fossil fuel to lower the total cost of compliance for the state. Finally, it avoids an underlying problem as to who "owns" a customer relationship. The fact that customers can easily change the dealer from which they buy fuel oil, propane and kerosene would make a requirement to acquire credits only from an obligated party's own customers challenging.

Notes on Section I – Ensuring Compliance: Default Delivery Agent

1. Single Entity Hired for Multi-Year Period

The default delivery agent should be a single statewide entity hired for a multi-year period. Making the default provider a statewide entity would allow for economies of scale to lower the costs of compliance. Also, because there can be significant effort required to ramp up programs to acquire credits, both the default provider's contract and any obligation assignments should ideally be for multi-year periods. To that end, it would be appropriate to require decisions to assign obligations to be made every three years – or some other interval, ideally aligned with the duration of the contract for the default delivery agent. Also, to enable the default delivery agent to effectively plan to acquire credits, it would need sufficient notice – at least six months – of the obligation being assigned.

2. Competitive Solicitation

The default delivery agent should be hired through a competitive procurement process run by the PUC (as was done in the past for the Efficiency Vermont contract). This would minimize the costs of compliance.

Notes on Section I - Non-Compliance Payments

Additional Recommendations

1. **Obligated parties that fail to acquire the number of credits required in a given year should have to make a non-compliance payment.**
2. **The magnitude of the non-compliance payment should be established and periodically updated by the PUC, and should be substantially higher than the cost of assigning an obligation to the default delivery agent would have been.**
3. **Non-compliance payments should be given to the default delivery agent to acquire emission reductions that make up for the shortfalls that precipitated the payments.** Consideration should be given to disproportionately applying such payments to the acquisition of clean heat credits from low income customers.

Rationale and Discussion

1. Penalty for Failure to Meet Obligation

As with any regulation, in order to ensure that emission reductions are actually achieved there would need to be a penalty for obligated parties that fail to meet their obligation. We call that a non-compliance payment.

2. Magnitude of Non-Compliance Payments

To provide a sufficient inducement for obligated parties to meet their emission reduction obligations on time, the magnitude of the non-compliance payment will need to be significantly greater than the cost of acquiring clean heat credits would have been.

Because the cost of compliance may change over time – both as a result of emission reduction requirements growing in scale and potentially as a result of costs for some compliance measures changing as market demand grows – the PUC should be charged with establishing and periodically updating the magnitude of non-compliance payments. Because the PUC is also charged with establishing payments for pre-assigning obligations to the default delivery agent (for obligated parties who choose that path to compliance), both values (non-compliance and pre-assignment payments to default delivery agent) should ideally be established and updated by the PUC at the same time.

3. Use of Proceeds from Non-Compliance Payments

Non-compliance payments should be provided to default delivery agent and used to acquire additional emission reduction credits within two years of when the payments are received. The generation of such additional credits will offset the previous year's credit shortfall which precipitated the non-compliance payment.

Consideration should be given to requiring additional credits acquired with non-compliance payments solely or disproportionately from low income customers. This is one potential mechanism for addressing equity concerns. Of course, the price of non-compliance payments would need to reflect the cost of any such requirements to focus on low income customers.

A. Banking of Credits

Recommendation

1. **Obligated parties that acquire more CHS credits than required for any given year can "bank" the excess credits for application to future year obligations.**

Rationale and Discussion

Obligated parties may acquire more clean heat credits than they need to meet their obligation for a given year. Indeed, some amount of "over-shooting" is highly likely to occur in many years if obligated parties see the cost of modest over-compliance to be lower than the cost of falling short of their obligations and having to make a non-compliance payment (see discussion of non-compliance payments in Section I below). Allowing any such excess credits to be applied to a future year's obligation will lower the cost of meeting the state's emission reduction goals. It will also likely enhance the likelihood of meeting annual goals by lowering the cost of over-compliance (since, from the perspective of the obligated parties, the credits from over-compliance are still useful and not "wasted"). Regulators will need to establish a system for tracking banked credits, but that should be relatively easy to implement.

B. Verification and Evaluation

Recommendation

1. **Verification of compliance with CHS requirements should be performed annually by the Vermont Department of Public Service (DPS).**
2. **The PUC should annually certify compliance or non-compliance of obligated parties.** Such reviews would leverage the results of the DPS review and resolve any disagreements between the DPS, obligated parties and/or other parties.
3. **The DPS should also sponsor evaluation studies on the actual field performance of CHS measures to support updating of assumptions used to assign them CHS credit values.**
4. **A small surcharge on all gas and delivered fuels should be established to pay for the DPS annual reviews and evaluation studies.**

Rationale and Discussion

1. DPS Annual Compliance Review

Just as it currently does for both efficiency utility savings claims and electric utility Tier 3 claims, the Vermont Department of Public Service (DPS) would be charged with annually reviewing each obligated party's compliance with its emission reduction requirements. That review would ensure that any deemed assumptions regarding CHS credit levels for common measures were properly applied. It would also require judgment on the reasonableness of assumptions for custom measures. Just as with its current review of efficiency utility and electric utility Tier 3 claims, the DPS should have a modest budget to hire consultants to support its reviews.

2. PUC certification of Compliance or Non-Compliance

The DPS review will be a critically important independent perspective on compliance. However, obligated parties and other organizations should have the ability to challenge the DPS conclusions and present alternative perspectives. Thus, there should be a process in which all such perspectives can be considered and adjudicated. The PUC is the logical venue for such a process – just as it is for energy savings claims by the state's efficiency utilities and Tier 3 compliance claims by the state's electric utilities.

3. DPS Evaluation Studies

As discussed in Subsection E above, there will be an on-going Technical Advisory Group (TAG) process through which assumptions regarding the CHS credit values for different kinds of emission reduction measures would be established. The TAG will make such decisions based on best available information. To ensure that the best available information is robust and current, the state will need to support modest investments in field studies on the actual effects of different CHS measures. As it does for the state's efficiency utilities and electric utilities implementing Tier 3 programs, the DPS should be responsible for identifying evaluation priorities, sponsoring field studies to assess actual impacts of different CHS measures in Vermont homes and businesses, and bringing those study results to the TAG process to inform updates to key assumptions. Of course, obligated parties and others can be expected to provide input to the DPS on evaluation priorities, scopes of work for field studies, and draft results. However, to ensure independence, the DPS should have final say on all such decisions.

4. Small Fossil Fuel Surcharge to Fund DPS Review and Evaluation Studies

Both the annual review and evaluation studies will require some technical resources. For example, the current DPS budget for evaluating the state's efficiency utility savings claims is a little under $2 million per year. A small surcharge on fossil fuel sales could be levied to provide funding necessary to support the DPS role in verification of compliance and evaluation.

C. Interaction with Electric Utilities' Tier 3 Requirements

Recommendation

1. **Electric utilities' RPS Tier 3 requirements should remain in place.**
2. **Emission reductions achieved by electric utility Tier 3 initiatives could also simultaneously count towards Clean Heat Standard goals.** The obverse would also apply – that clean heat credits generated by parties other than electric utilities could count towards electric utility Tier 3 obligations if the electric utilities acquire the Tier 3 "rights" to them.
3. **Electric utilities would be able to sell the CHS attributes of Tier 3 projects to CHS obligated parties.** The obverse would also apply – CHS obligated parties could sell Tier 3 attributes from projects they initiate to electric utilities.

Rationale and Discussion

1. Electric Utility RPS Tier 3 Requirements Would Remain

Vermont's Electric Utility RPS Tier 3 requirements to reduce customers' consumption of fossil fuels is an innovative, landmark policy. It has clearly launched the state down a path to reducing GHG emissions from the thermal sector (most Tier 3 emission reductions are coming from the thermal sector, primarily from heat pumps displacing fossil fuel heat). Now in its fifth year, implementation of the policy is running smoothly with even faster progress in reducing emissions than initially planned.[9] Based on both results to date and the annual goals set in statute, we estimate that Tier 3 requirements will ultimately require annual thermal sector emission reductions of about 7% by 2030. That represents a significant "down payment" on the 40% reductions by 2030 required by the 2020 Vermont Global Warming Solutions Act. As we discuss in Section II of this paper, the state could conceivably meet the thermal sector portion of the state's new 2030 emissions reduction goal by simply increasing the magnitude of the Tier 3 requirements by a factor of five or six. However, for reasons also articulated in Section II, we believe a Clean Heat Standard that imposes an emission reduction obligation on suppliers of fossil fuels makes more sense as a policy vehicle to fill the gap between the emission reductions that Tier 3 will provide and the state's new emissions reduction goals.

On the other end of the spectrum, the *Clean Heat Standard* could be designed to achieve the ***total*** emissions reduction required to meet the thermal and industrial sector contributions to State GHG emission reduction goals. If that were the case, the current electric RPS Tier 3 requirement would no longer be necessary. However, we believe that there are significant advantages to keeping the electric RPS Tier 3 requirements in place – in concert with the Clean Heat Standard. First, the policy appears to be working very well, with the state's electric utilities having developed an effective program infrastructure for delivering and documenting reductions in fossil fuel consumption. It may be better to build on that infrastructure than to tear it down and start the CHS from "ground zero". Second, with the Clean Heat Standard obligations being imposed on fossil fuel wholesalers, there may be an incentive for the CHS obligated parties to favor biofuels over electrification and other potential measures. Maintaining the electric RPS Tier 3 as a mechanism that would generate a modest portion of CHS emission reduction requirements, with the electric utilities' own likely bias towards electrification measures, could provide some balance to the range of solutions pursued across Vermont.

Put simply, we conclude that the advantages to maintaining the electric utilities' RPS Tier 3 requirements outweigh the advantages of terminating them. It should be noted that this decision could be revisited in future years. Note that it would likely be both much less disruptive to keep Tier 3 now and terminate it later than to terminate it now and need to restart it later.

2. Emission Reductions Achieved Under Electric RPS Tier 3 Can Count toward CHS Requirements

As depicted in Figure XX below, Tier 3 could conceptually interact with a Clean Heat Standard in one of two ways. The first option would be to make Tier 3 and CHS requirements completely separate from each other. Under this approach emission reductions generated by the electric utilities through Tier 3 programs would count only towards Tier 3 requirements and emission reductions generated by fossil fuel wholesalers would count only towards CHS requirements. The CHS emission reduction targets would be based on the total emission reductions from buildings and industry that are required by the state, minus the portion expected from Tier 3 initiatives.

[9] Green Mountain Power, which accounts for about three-quarters of the state's electricity sales, achieved about twice as much fossil fuel reduction as required by statute in 2020 (Green Mountain Power, *Cutting Carbon: RES Tier III Savings Report, 2020 Plan Year*, March 15, 2021.

The second option would be to make Tier 3 and CHS requirements overlapping. Under this approach emission reductions from buildings and industry[10] that are generated by electric utilities through Tier 3 programs could count towards both Tier 3 and CHS requirements and emission reductions generated by fossil fuel wholesalers would count towards CHS requirements, and if sponsored by an electric utility could count towards Tier 3 requirements as well.[11] Because the thermal sector emission reductions expected from Tier 3 are a just a subset of the total reductions required to meet the state's climate goals, this approach would be like making Tier 3 a "carve out" of the CHS. It would be analogous to Vermont's current electric RPS which requires 75% of electric generation to be renewable by 2032 (Tier 1) and 10% of generation from distributed renewables (Tier 2), with generation from distributed renewables counting towards both Tier 1 and Tier 2 requirements.

Figure: Conceptual Models for Tier 3 – CHS Interaction

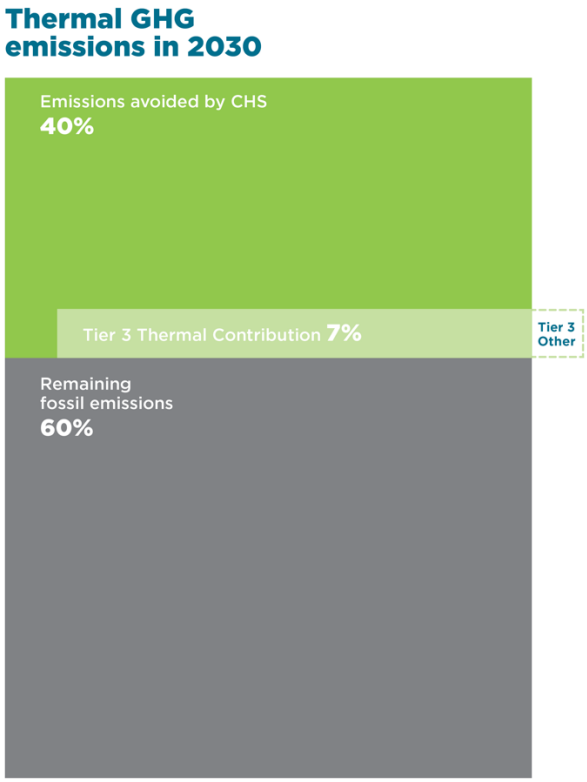


Figure 11. Most utility Tier 3 actions also contribute to meeting CHS requirements

There are a number of advantages to this second option. Most importantly, it will align the objectives of electric utilities and fossil fuel wholesalers obligated under a CHS. That will facilitate pursuit of least cost

[10] Most of the Tier 3 reductions being generated today are from buildings and industry. However, some are from the transportation sector and increased renewables. Only the reductions from buildings and industry would be overlapping with a CHS as the concept is envisioned in this paper.

[11] Note that about 10% of Tier 3 emission reductions are currently from non-thermal sectors, primarily transportation. In both models those reductions would count only towards Tier 3 requirements.

solutions to both sets of regulatory requirements. It will also reduce confusion in the market that could be created by electric utilities and fossil fuel suppliers completing for the emission reductions from the same customers with the same measures.

3. Selling of CHS and Tier 3 Attributes

The mechanism through which emission reductions of Tier 3 and CHS credits could count towards each regulatory requirement would be the assignment of both a CHS attribute and a Tier 3 attribute to each unit of emission reduction. Electric utilities who generate emission reductions could sell CHS attributes to wholesale fossil fuel suppliers and the fossil fuel suppliers could sell Tier 3 attributes to electric utilities.

Note that CHS and Tier 3 attributes are overlapping, but different. CHS would be measured in CO2e reductions in a time-stamped year. Tier 3 compliance is measures in units of lifetime fossil fuel reductions (expressed in MWh equivalents). However, as long as the underlying assumptions for computation of each value are the same (see discussion in Subsection E above), these differences would not be of any concern.