



Policy Brief: Alternatives to Thermal Sector Carbon Pricing

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Whether an individual is motivated by climate change and pollution, geopolitical policies and power dynamics, or merely the economic stagnation that stems from reliance on 19th century energy technologies; fossil fuels remain highly problematic. Solutions, often well intended, do not always consider the full range of ramifications and impacts of policy change. If we think in single dimensions, we may miss hidden costs or overestimate the real-world transformations that would become more apparent if we pull back and ask questions that approach energy with ecological thinking. Environmentally, everything is deeply interconnected and no action can be thought of in isolation. Our goal at Campaign for Vermont is to ask the kinds of questions that look into the ripple effects of any and all energy initiatives, to understand how we best measure their full impact, and to entertain alternative approaches arising from the fast pace of innovation.

With the legislature currently considering some form of carbon pricing as a mechanism for lowering our carbon footprint here in Vermont, we must evaluate the efficacy and feasibility of this strategy. By incentivizing Vermonters to move to renewables, both in terms of transportation, home heating, and power, it is paramount to examine such a move in its full complexity. There is no doubt the overall goal (vastly reducing our carbon footprint) is virtuous, but we should pause to contemplate the optimal means of getting there. A key piece not to overlook is how the multiple energy transitions interplay with one another.

The transition to EVs requires foresight into the scaling of both our power grid and installation of a sufficient number of high-speed power chargers throughout the State. It should self-evident that we can't allow for long lines delaying workers and travelers at every charging station. Such a scenario would no doubt frustrate drivers, giving pause to Vermonters wanting to make the desired change. The result would be a delay in the process of transitioning to lower-carbon solutions for transportation, something we saw with the introduction of hybrid vehicles.¹ With over half of consumers now interested in electric vehicles, the best way to drive adoption is to reduce friction: in other words, to make it simple, easy, and affordable.² If those consumers have a bad experience with their first EV ownership, it will have a negative effect on long term adoption of this technology.

¹ <https://www.latimes.com/business/la-xpm-2012-apr-09-la-fi-mo-repeat-hybrid-car-buyers-20120409-story.html>

² <https://www.thezebra.com/resources/research/electric-vehicles-report/>

In the transportation sector, the solution to carbon emissions is evident. The technology exists, it is scaling, the economics are in its favor, and the tipping point is on the horizon. However, with 45% of emissions riding on this transition, policymakers would do well to focus on making it as smooth of a transition as possible with proper infrastructure buildouts, consumer friction, and a careful eye on the energy mix supporting this new demand.

When it comes to home heating, the challenges are far more pronounced. Unlike the transportation sector, the operational cost of electric heat is currently higher than their fossil fuel counterparts. Not only that, but the upfront costs for thermal heat pumps can reach twice that of other technologies. Those key advantages that going electric has in the transportation sector vanish in the heating sector. Those that will feel the economic pinch the most from a forced switch to these technologies are vulnerable Vermonters, many of whom are on fixed incomes.

Even if this economic reality were not the case, our grid cannot easily meet the increased demand for electricity (for both thermal and transportation) without buying it from out-of-state, largely from fossil fuel generation in states south of us. However, unlike in the transportation sector where the inefficiencies of internal combustion engines make even fossil fuel powered electricity an improvement, there is a pronounced difference compared to the efficiency of existing gas and oil heating sources.

These efficiency losses cut into our carbon reductions: the transformations from chemical energy to mechanical energy to electrical energy and then to heat demands calculations that can prove their benefit over on-site generation in traditional furnaces. An example of this sort of analysis is looking at the energy losses of taking a carbon fuel (likely natural gas) and burning it to create electrical energy (roughly 35-50% efficient³). Add in transmission losses around 5% and, even with a 100% efficient electric heating system, only 30-45% of that fossil fuel energy actually gets used to keep people's homes warm. High efficiency gas furnaces can reach over 90% in heat efficiency, but even older systems can achieve 56% or better.⁴ This means that the energy mix being used during the winter, when solar and hydro production is low, is very important for determining the overall benefits of moving towards electric heating solutions.

There are also issues with grid capacity and instability that are also necessary to examine here. Putting all our energy eggs in one basket is a risky proposition. Today if the power goes out people can get by with generators or off-grid solar systems if they turn off their larger appliances. That would likely not be the case if they were also reliant on electrons for heating.

There are also social impacts to consider. If we use taxes or carbon-pricing to nudge the incremental adoption of cleaner fuels, such as natural gas, then we have to face the fact that there is a clear advantage to those situated along the pipeline in the more heavily populated north-western part of the State. This means that the affluence of Chittenden County will

³ <https://www.sciencedirect.com/topics/engineering/natural-gas-combined-cycle>

⁴ <https://www.energy.gov/energysaver/furnaces-and-boilers>

continue expand at the expense of the poorer regions of our State for whom there is no easy access to pipeline hook ups or lower carbon fuels. Carbon pricing risks a transfer of wealth from some of our most economically struggling rural regions to those centered around the pipeline. All this at a time when the costs of heating fuel and electricity are already particularly burdensome, this only compounds the problem.

The cost of heating oil peaked at \$5.72 per gallon (US average) in October⁵, a 167% increase since the same time period in 2020. Propane also saw a 32% increase over that same time period.⁶ These are economic realities that we need to consider. If the cost of fossil fuels continues to rise, alternatives like domestically produced biofuels or electron-based heating may start to make more sense, but we should be careful to add additional financial burden on low-income or rural Vermonters.

This does not mean that we should do nothing. We need to explore all of our options. Decisions have to wed short-term needs with a long-term view of things. We also can't be mired in the status quo, especially when we are in the midst of exponential technological change. Recent breakthroughs in fusion power, materials science, AI, battery technologies, enhanced geothermal, and more suggest that we have an ever-growing set of options that suggest tomorrow will be profoundly different from today.

We are just reaching the tipping point in the adoption of EV's and the next decade will see the radical change in the transportation sector that we are talking about, but it is important to note the time it took to get here. The first EV launched in 2008, but it took over a decade to demonstrate that the technology was viable and scalable. In the thermal sector, it is much like the early days of EV's, heating with electrons may be the solution but there are many other competing solutions still being tested and there is no clear advantage that has proven to be more efficient, cost effective, reliable, or scalable. It may very well be that a dramatic reduction in the cost of electric power will make this technology more viable, fusion power has the potential to deliver this. It could be a rapid-growth biofuel like the US military is testing. It could be revolutionary new battery storage tech that allows for cheap baseload solar.⁷ It could be something we haven't even thought of yet.

In keeping with Campaign for Vermont's long-held position on good government, we would be remiss to not point some of the process issues in this bill. Legislation with this large of a price tag demands rigorous financial analysis and careful consideration. Our state constitution and the frugality of Vermonters demands that new state spending provide a more significant public benefit than if those funds had never been raised in the first place. This is the lens we must look at each major spending initiative through. That sort of analysis cannot be performed on this bill because the costs to Vermonters are unclear. As it stands, the only people who are certain to

⁵ https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=W_EPD2F_PRS_NUS_DPG&f=W

⁶ https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=W_EPLLPA_PRS_SVT_DPG&f=W

⁷ See companies like [Electrovaya](#), [Hyliion](#), [Enovix](#), [QuantumScape](#), or [Sila Nanotechnologies](#)

benefit are electric utilities and heat pump installers. Even more worrisome, it's not the legislature who will be deciding this, it's an unelected state body. This is an abdication of the Legislature's authority and responsibility to Vermonters. Would we let the State Board of Education set property tax rates? No, of course we wouldn't. And yet legislation under current consideration asks the Public Utilities Commission to do the same.

To be clear, we do not support a carbon-pricing scheme at this time. It is a blunt instrument that is bound to do unintended harm to Vermont's most vulnerable. However, there are some specific areas we recommend policy makers to look at:

1. We might consider a more limited gesture by adding to our considerable Vermont carbon sink by rewilding some of our fields and pastures. If this was done by purchasing farm land along, Lake Champlain and other waterways suffering from eutrophication, we would get a two-for-one environmental benefit, reducing field fertilizer runoff alongside carbon capture. While such conservation efforts would not make the grand splash some may long for, it might be a more meaningful step as we await more powerful innovations down the road.
2. Carbon does not respect state or national boundaries. If our true goal is to reduce global carbon emissions, then the state of Vermont might be best-off finding the investment opportunity with the highest payoff in terms of environmental impact, even if it is not within the borders of Vermont. For decades, it has been apparent that the southern part of our country has better overall performance with utility scale solar for both photovoltaic and solar thermal than our snow-covered corner of the world. According to this logic, we might be able to stretch our dollars further, building out projects in Arizona or New Mexico, rather than taking over another farm field with solar panels that struggle with variable performance due to weather and climate.
3. Along the same lines, the idea of preserving large tracts of land as forests and expanding this natural carbon-capture mechanism might do better in geographic locations where land is cheap to acquire. Already, drones are revolutionizing the planting of vast amounts of trees and the management of forests. This could be the equivalent of taking millions of cars off the road if we factor 240 trees offsetting the annual carbon emissions per car.⁸
4. Closer to home, there is another option to look at for utility scale baseload renewable power. New drilling technologies have rapidly expanded the feasibility of geothermal power across the globe. We are not aware of any recent geological survey in Vermont specifically around the feasibility of citing geothermal power generation here. This could be a worthwhile investment to

⁸ <https://sparkconcept.com/how-many-trees-does-it-take-to-make-up-for-one-cars-carbon-emissions/>

see if this is an option for rapidly creating more clean reliable power generation and offsetting some of that carbon-based power we spoke of earlier.

5. If the legislature is adamant about pursuing some sort of carbon-pricing scheme (again, we are still opposed to this at the current time); we would encourage a threshold trigger be put in place. As noted before, the costs of heating fuels has increased significantly over the past two years or so – stretching the means of Vermont’s most vulnerable. If any sort of carbon pricing scheme should be attempted now it should only go into effect if fuel prices drop below a certain threshold, thus not adding to already inflated prices. Anything short of this is just plain tone-deaf to our economic realities and the needs of Vermonters.

So often, the only progress that harnesses our political will is the change that happens in our backyard, that which we can point at and see every day at the local level. Unfortunately, the global climate problem will not be solved in our backyard. We should absolutely do our part, but we should also not delude ourselves into thinking that we will solve everything on our own. Even more important, we should be careful about forcing solutions that may turn out, in the end, to be less than optimal. While clearly any path we take requires further study, the hope is that our set of options will expand alongside the power of the tools we use.

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