

Testimony for the Senate Natural Resources and Energy Committee
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Introduction

Thank you Chair Bray and members of the committee. As always, I appreciate the opportunity to join you.

For the record my name is Jared Duval. I am testifying today in my capacity as a member of the Vermont Climate Council, to which I was appointed to provide expertise in energy and data analysis. On the Council I serve as Co-Chair of the Science & Data Subcommittee, and as a member of the Cross-Sector Mitigation and Steering Committees.

I would like to respond to testimony you heard last week from Secretary Moore.

Up front, I want to be clear that the Secretary was not presenting analysis commissioned by or reviewed by the Climate Council.

The independent, professional analysis that *has* been commissioned by the Council and by the Agency of Natural Resources – specifically the Marginal Abatement Cost Curves report – shows what I shared with you in my previous testimony: an expected net lifetime savings of \$2 billion, or \$7,500 per household, as a result of actions taken between now and 2030 to meet the pollution reduction targets in the thermal sector, which is what the Affordable Heat Act is designed to do.

That \$2 billion net lifetime savings does not include an additional estimated \$3 billion in avoided economic damages, calculated using the social cost of carbon adopted by the Vermont Climate Council (and the State of New York), which brings the total to \$5 billion in economic savings and avoided economic damages.

Unlike the Marginal Abatement Cost Curves report, the Secretary's self-described "back of the envelope" analysis was never shared with the Climate Council – nor was it ever reviewed by the Science & Data subcommittee of the Council, which I co-chair. Why the administration felt the need to ignore their commissioned analysis and rush out different analysis that had not been fact checked or carefully reviewed is not clear to me. I am especially concerned because, upon just an initial review, I and other independent analysts have found the Secretary's analysis to contain many errors and omissions, leading it to be both deeply flawed and grossly inaccurate.

Before I go farther, I want to share my belief about the responsibility that policy analysts and modelers have. Much of this belief was formed during my training in public policy analysis, including graduate courses in economics and the ethics of public policy as part

of my Master of Public Affairs program. It was further developed during the time that I served in state government, at the Agency of Commerce and Community Development, and also over the last six years where I have conducted energy and economic analysis while leading the independent, non-partisan, non-profit organization Energy Action Network. It has also been developed over the last two and a half years while serving on the Vermont Climate Council, as the Councilor appointed to provide expertise in energy and data analysis.

I believe that the job of policy analysts is to inform decision makers and illuminate policy issues, to the best of our ability, drawing on the most up to date, accurate, and complete data and information at hand. It is to present that information as fully and honestly as possible, regardless of whose position it supports. And to do so both carefully and with humility.

Response to the Analysis Presented by Secretary Moore

When I first came to testify to this committee on the Affordable Heat Act, Chair Bray asked me to share what the net costs or net savings would be from meeting the thermal sector greenhouse gas reduction requirements by 2030, which is what the Clean Heat Standard that the Affordable Heat Act would establish is initially designed to do.

Again, that is a question that has been answered in a report to the Climate Council, commissioned by the Agency of Natural Resources, known as the [Marginal Abatement Cost Curves](#) report.

The report estimated that all the modeled thermal sector emissions reduction activity between now and 2030 would lead to about \$3 billion in lifetime savings from measures that generate net savings while resulting in about \$1 billion in lifetime costs from measures that generate net costs. I shared the result of that equation: about \$2 billion in net lifetime savings as a result of all of the modeled thermal sector emissions reduction measures between now and 2030.

1) The presentation of costs from Secretary Moore was not a presentation of *net costs*. (see slide 7).

The Secretary framed part of her testimony by saying, “a number of witnesses have spoken about the benefits” and then went on to say, “but the up-front costs are also real.”

To the extent the Secretary may have been referring to my testimony, her statement would be fair if I had only focused on the savings. But I did not – I presented the net savings, after accounting for costs.

Specifically, I presented the answer that independent analysis generated for the Agency of Natural Resources and the Climate Council – about \$2 billion in net lifetime savings as a result of actions taken between now and 2030.

In contrast, the Secretary presented you with a figure that focused entirely on costs and did not account for either savings or the difference between costs and savings (net savings).

Here I would like to note that an approach that focuses only on up-front costs and not on benefits or savings would lead us to make very poor decisions in our daily lives, such as never going to the doctor because it costs something up front, or not weatherizing your home to achieve dollar savings and improve health, because it costs something up front.

2) The analysis that the Secretary presented (slide 9) only gives long-lived measure investments a fraction of their value and assumes they would be expensed up front rather than amortized over their lifespan, inflating the price effect by 10-14 times.

Given the 2025, 2030, and 2050 requirements of the Global Warming Solutions Act, the Clean Heat Standard is designed to exist until at least 2050, perhaps beyond.

The analysis shared by Secretary Moore was cut off at 2030.

However, installed measures like heat pumps, heat pump water heaters, and weatherization all have "measure lives" that will result in both bill savings for customers and the generation of clean heat credits that will be bought by obligated parties -- i.e., they will generate economic value -- for anywhere from 13-25 years (so from 2026 - 2038, or from 2026 -2050), not just for 1-5 years (i.e., from 2026-2030). Specifically, in the Technical Resource Manual that Vermont uses to characterize the lifespans of these measures, the estimates are 13 years for heat pump water heaters, 15 years for heat pumps, and 25 years for weatherization.

When you have something of economic value that has a long life, the correct way to account for it as a business, which all obligated parties are, is via amortization of costs over the life of investment, not incurring and expensing that cost all in one year. Because the clean heat credits generated from installed measures and purchased by obligated parties will generate economic value for obligated parties for 13-25 years, the obligated parties, which use business accounting, will amortize their cost to acquire those multi-year credits for their respective 13–25-year time periods, not incur or expense them all up front.

Another way to say this is that an obligated party who incentivizes a customer to install a heat pump in 2026 would recover the cost of that incentive not just in 2026 - and not even just from 2026 through 2030 - but from 2026 through 2040.

This leads to the first major problem with Secretary Moore's analysis: she assumed that if a fuel importer who is an obligated party provides an incentive for a customer to install a heat pump, that the obligated party would then seek to recover that entire incentive

amount in the year it is spent. But remember, a heat pump installation doesn't just reduce emissions in the year it is installed. It also reduces them for the next fourteen years as well. Thus, it reduces the obligated party's (the fuel importer's) cost of complying with the Affordable Heat Act not just for one year, but for fifteen years.

As a result, obligated parties would amortize or finance that cost over fifteen years, not over just one year. This is the same thing that utilities do when they make an investment in a new power plant, a new electric substation upgrade, or a new part of the gas distribution system. Obligated parties who don't want to amortize investments in multi-year clean heat measures can also assign their obligation to the default delivery agent, sell one-year measures (biofuels, etc.), or simply purchase one year's worth of clean heat credits from an installer - all ways that they will be able to pay for only a single year's worth of their obligation in each year.

By assuming that fuel dealers and other obligated parties would fully recover the lifetime cost of measures that produce clean heat credits for decades in just one year, Sec. Moore significantly overstated the near-term impact on prices for fuel oil and propane. After accounting for a discount rate, the overstatement is probably a factor of roughly 10 to 14 in the first year of the policy.¹ While there would likely continue to be additional increases as emissions go down, even by 2030 they would be significantly less than the numbers cited by Secretary Moore.

The Secretary suggested that her analysis may be off by a factor of two. By not valuing the full life of the measures and not using amortization schedules, as is appropriate for the business accounting that obligated parties would use when purchasing multi-year clean heat credits, her analysis is already off by more like a factor of about 10 to 14 in the initial year of the policy.

3) The analysis the Secretary presented assumes that all Vermont residents would have to be provided with incentives covering 90% of the up-front cost (slide 10) to be motivated to do things (weatherize homes and install heat pumps and heat pump water heaters) that often already save money over time without providing any (0%) incentive, or just a very low incentive, toward the cost of installation. This 90% assumption is unreasonably high. Combined with the previously discussed error, this leads the Secretary's estimate to be perhaps 20 to 28 times too high in the initial year of the policy.

The assumption of needing to pay 90% or more of an incentive may be true for low-income Vermonters who don't have savings or easy access to capital and do often need 100% of costs covered, often via grants (and doing so is important for equity reasons).

¹ If we use a real discount rate of 5% to finance \$1,000 over 15 years, the annual payment is about \$96. In year 1, the Secretary's analysis would be off by about a factor of 10.4 (\$96 vs. \$1,000) for a heat pump. For a 25 year weatherization job, the Secretary's analysis would be off by a factor 14.1 after 1 year (\$71 vs \$1,000).

However, even for low-income customers, it may not always be necessary to pay 100% incentives if there are alternative options for financing investments over time, in ways that still result in savings. For example, VGS has a heat pump water heater leasing program that eliminates the up-front cost barrier. The Weatherization Repayment Assistance Program (WRAP) is another model that addresses the up-front cost barrier.

Either way, lower-income Vermonters are anticipated to generate only about 16% of the emissions reductions resulting from clean heat measures in the overall program, or about 30% of the emissions reductions in the residential market.

Extrapolating an assumption that's appropriate for lower-income Vermonters to all customers is inappropriate. Assuming that incentives covering 90% of the cost will be necessary to entice *all* customer groups to take actions that are in their economic interest absent any or very little extra incentive is simply far too high.

The Secretary cited Efficiency Vermont's incentives in her testimony. My understanding is that most of the incentives available from Efficiency Vermont (often complemented with electric utility incentives) are usually less than 30% of project costs (when including the electric utility additions). The only case of a 75% incentive that I am aware of is the weatherization incentive for low-income households, and even that is capped at \$5,000, which will leave many low income home-owners with a larger necessary investment to complete their projects, since the average weatherization project is higher than \$6,666. For heat pumps, heat pump hot water heaters and advanced wood heat, the incentives are less than 30%. To assume that higher incentives than these will be necessary to generate additional installations is reasonable. To assume that all this activity would require incentives three times higher than current incentive rates is not reasonable.

That leads to another point: Secretary Moore's analysis seems to ignore all of the activity that is already occurring. Specifically, based on State and Efficiency Vermont data, over the past few years that includes nearly 3,000 weatherization projects per year, about 10,000 heat pumps a year, and about 2,000 heat pump water heaters a year. While much of this activity is happening with some form of incentive (through weatherization assistance or Tier 3), all of this activity is already happening *without any extra incentive provided by fossil fuel companies in the form of clean heat credit payments*. And all of it will count towards Clean Heat Standard compliance.

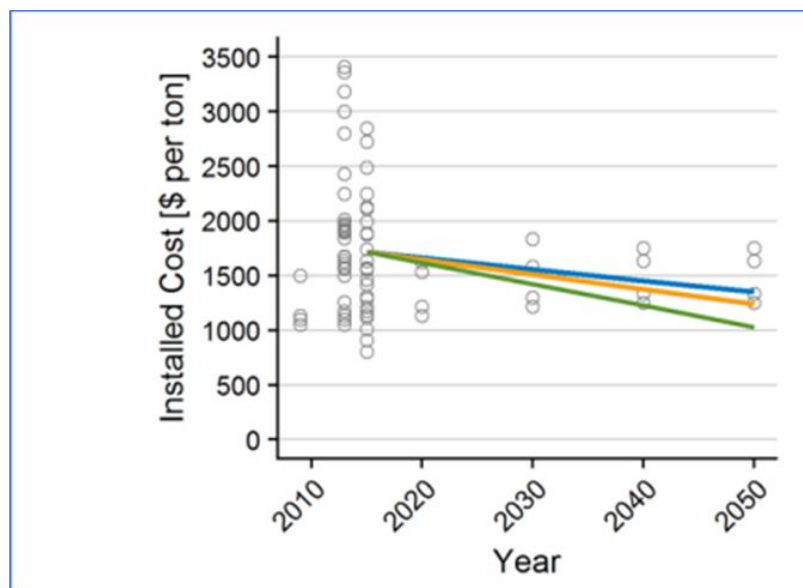
And much of this activity will also happen as a matter of course. Take the example of heat pump water heaters. If your water heater dies and you need to replace it, would most Vermonters expect to pay only 10% of the cost when, in the absence of the incentive, they would likely be paying 100% of the cost of a new water heater? For many of these measures there is an important difference between modeling the incremental cost (i.e., compared to the alternative option) versus the full up-front cost of the equipment. Secretary Moore made the mistake of assuming that the Affordable Heat Act will impose the full cost of new equipment on the market rather than the incremental cost difference between an electric heat pump water heater and a new propane model.

In other words, not only was the 90% average incentive assumption problematic, but her analysis incorrectly assumed it would always be applied to the full cost of new equipment rather than the incremental cost (note: to be fair, this critique only applies in the case for new equipment for which there is a low carbon alternative; for weatherization, it is always the full cost that is at issue).

If the 90% incentive assumption is too high by at least a factor of 2, which seems plausible upon initial review, then, in addition to the failure to account for the full value of long-lived measures and to properly amortize their investment cost, that would bring the overall possible magnitude of error in the Secretary's calculations to a factor of 20 to 28. **Stated differently, the estimated price increase that she said fossil fuel users might expect in 2026 and then on an annual basis going forward is perhaps 20 to 28 times too high, or more.**

There are other problems with the analysis as well:

- The analysis the Secretary presented also doesn't account for expected price declines per unit for heat pumps, heat pump water heaters, etc. as we benefit from economies of scale. Several years ago, the National Renewable Energy Laboratory (NREL) released a report that, among other things, forecasted how heat pump prices are expected to decline in the future as electrification advances. This pace of decline is likely to accelerate even faster given the recent passage of the IRA. Pasted below is a graphic illustrating their conclusion along with a reference for the report.



Jadun, P., McMillan, C., Steinberg, D., Muratori, M., Vimmerstedt, L., & Mai, T. (2017). *Electrification Futures Study: End-Use Electric Technology Cost and Performance Projections through 2050*. Golden, CO: National Renewable Energy Laboratory. NREL/TP-6A20-70485. P. 42.
<https://www.nrel.gov/docs/fy18osti/70485.pdf>

- The Secretary’s analysis appears to assume that up-front costs would only be spread across fuel oil and propane sales, which together totaled about 250 million gallons in Vermont in 2019 (Source: EIA). This leaves out pipeline gas, which represented 24% of thermal fuel sales in Vermont in 2019.
- While the Secretary’s analysis attempted to account for federal incentives, it appears that it did not account for state level programs that are already delivering emissions reductions in the thermal sector that would also count toward umbrella Clean Heat Standard compliance, including the Weatherization Assistance Program and other state funded weatherization program and Tier 3 programs (yes, fossil fuel companies will have to pay service providers to acquire those credits but, again, not at anywhere near 90% of total cost); not to mention other voluntary actions being taken by Vermonters without existing incentives.
- The Secretary’s testimony talked about up-front costs (what I think are better understood as up-front investments, especially as they will be spread out over time by obligated parties) but did not speak about them *relative to the cost of another policy that could achieve the same emission reduction outcome*. The administration has not suggested another thermal sector policy to replace a Clean Heat Standard. We cannot compare the up-front cost of this policy to the up-front cost of doing nothing – both because a) inaction does not allow us to achieve customer savings over time from reducing dependence on fossil fuel and, b) legally speaking, doing nothing is not an option, given that we are legally obligated to comply with the Global Warming Solutions Act.

But focusing primarily on the first three major errors in the Secretary’s analysis covered earlier in this testimony makes the main point:

These are complex issues that deserve careful analysis -- *the kind of analysis the PUC is best suited to do through expert analysis and the rulemaking process*. If the concern is price impacts on fossil fuels, it should also be noted that there are cost control guardrails already in the bill that are designed to address that (see, in particular, S.5, §8124 (a) (4)).

I respect Secretary Moore. I know her to be a dedicated public servant. However, because I respect her and you, I have to say that what she presented to you last week was inappropriately selective, improperly done, and deeply misleading.

She testified that she was “confident she was wrong”. I am also confident that she was wrong – very wrong. The questions she was trying to answer – the price effect of a policy on the price per gallon of a fuel – are nearly impossible to answer until the rules have been finalized and the market has actually been created. This modeling challenge involves a multitude of variables, assumptions, and interactive effects. A confident, responsible answer to that question simply cannot be generated in a back of the envelope manner.

I am not here to offer an alternative number to Secretary Moore's analysis. While I am confident that her analysis vastly exaggerates the price effect on fossil fuels, to be more precise about what a more appropriate number might be would take building a sophisticated model that better accounts for the nuance and complexity I referred to – and, again, that is the careful analysis that I expect will take place in the PUC process, and then be reviewed by the legislature, given how S.5 is written.

For now, the only actual economic estimate we have from independent experts – experts who were hired by the Secretary's own agency – is that the Affordable Heat Act, if it reduces thermal sector emissions as envisioned in the Climate Action Plan, could save Vermonters a total of \$2 billion, or \$7,500 per household just as a result of activity between now and 2030.²

Where else can we look?

We can also draw on real world evidence from the closest example to this policy in another state: Oregon's Clean Fuels Standard, which is also a performance standard for fossil fuel importers.

What Oregon found was that for every 5% reduction in carbon pollution achieved, it resulted in about a 1% increase in the price of fossil fuels.³ At the same time – and this is very important – the policy also resulted in *decreases in the prices of the cleaner alternatives*.

So, while their Clean Fuel Standard had a price effect of an additional \$0.05 to \$0.06 per gallon of fossil fuel in 2021, in that same year it also brought down the price of biodiesel from used cooking oil by about \$1.16 per gallon, and the price of biodiesel made from soybean oil by about \$0.61 per gallon, making *biodiesel less expensive than diesel*.⁴

And that's part of the goal of a Clean Heat Standard. It's not to get people to pay more – it's to help people pay *less*, saving on energy costs that have been far too high for far too long because of fossil fuel dependence.

For instance, for those fuel oil customers who currently use fuel oil and who want to save money, they will be able to use biodiesel instead, thereby lowering their heating costs (if the price of B100 biodiesel from used cooking oil or from a standard soybean biodiesel is reduced as much in VT as we saw in Oregon).

We should also reasonably expect the price of electricity to decline in VT in the near to medium term as a result of the electrification that the Affordable Heat Act will help

²<https://outside.vermont.gov/agency/anr/climatecouncil/Shared%20Documents/MAC%20Curve%20Deliverable%20Memo%20Clean%20Version.pdf>

³ <https://www.opb.org/article/2021/10/14/oregon-has-a-plan-to-cap-emissions-from-fuels/>

⁴ See: <https://www.youtube.com/watch?v=C4vHeWo16vc> (around 1:44:00 to 1:48:00)

advance, as fixed utility costs get spread over a broader base of use. This would help offset any price increase on fossil fuels. And since all Vermonters use electricity, we would *all* realize that benefit (whereas not all Vermonters use fossil heating).

And of course, a Clean Heat Standard would be especially important in its ability to make weatherization, heat pumps, and heat pump water heaters more affordable and more accessible, giving many more options to help people escape from fuel prices that are, by their nature, high cost and price volatile.

Overall, this policy is designed to achieve massive net savings in energy costs alongside legally required pollution reduction.

In conclusion, I want to reiterate my belief that it is irresponsible and misleading to selectively present up-front costs as though they are the whole story and then to ignore the expected savings on both sides of the economic modeling equation.

It is also irresponsible and misleading to present vastly exaggerated price effects on fossil fuels – and to do so without also communicating estimated price effects on the cleaner alternatives, from biodiesel to electricity, which are expected to drop in price while also becoming much more accessible as a result of the Affordable Heat Act.

Thank you for the opportunity to testify today. I am happy to take any questions.