Representatives,

Slide after slide, Julie Moore and Collin Smyth declared certain CO2 emissions “biogenic” and thus excluded from the greenhouse gas emissions inventory. Ms. Moore declared that this is “consistent with IPCC guidelines for calculating a greenhouse gas inventory.” With regard to the carbon-neutral assumption underlying the exclusion of biogenically derived CO2, Mr. Smyth claims “that is the assumption pretty much everyone makes at this point.” Ms. Moore and Mr. Smyth are both incorrect. The administration’s decision to exclude biogenically derived CO2 is a policy decision not supported by science. In fact, both New York and Massachusetts recently removed biomass from their renewable energy options.

The IPCC clearly states that biogenic emissions should be included in AFOLU sector. You can read the IPCC guidelines here: https://www.ipcc-nggip.iges.or.jp/public/2019rf/vol2.html

The pertinent language from *2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories:*

> 2.3.3.4 TREATMENT OF BIOMASS
> Biomass is a special case:
> • The overall IPCC approach to greenhouse gas emissions from combustion of biomass or biomass-based products (e.g., ethanol) at the national level allows for complete coverage of emissions and sinks, and involves all IPCC sectors, including in particular, Energy, Agriculture, Forestry and Other Land-Use (AFOLU), and Waste.
> • Carbon dioxide (CO2) emissions from the combustion of biomass or biomass-based products are captured within the CO2 emissions in the AFOLU sector through the estimated changes in carbon stocks from biomass harvest, even in cases where the emissions physically take place in other sectors (e.g., energy). This approach to estimate and report all CO2 emissions from biomass or biomass-based products in the AFOLU sector was introduced in the first IPCC guidelines for national greenhouse gas emissions (IPCC 1995), reflecting close linkages with data on biomass harvesting, and for the pragmatic reason to avoid double counting.
> • In the Energy sector, CO2, methane (CH4) and nitrous oxide (N2O) emissions from combustion of biomass or biomass-based products for energy are estimated, but the CO2 emissions are recorded as an information item that is not included in the sectoral total emissions for the Energy sector, as they are already included in AFOLU. The CH4 and N2O emissions from the combustion of biomass for energy are included in the sectoral total emissions in the Energy sector, as emission rates depend on combustion and transformation conditions and cannot be estimated using AFOLU carbon stock change methodologies. This provides a complete picture of a country’s energy system and avoids double counting of emissions with those reported in the AFOLU sector.
> • *For biomass, only that part of the biomass that is combusted for energy purposes should be estimated for inclusion as an information item in the Energy sector.*

There are 2,000,000 tons of CO2 emitted annually in Vermont that are not inventoried according to Jane Lazorchak, who made this claim to the Senate Committee on Energy and the Environment. According to the EPA, the McNeil electric plant emitted over 453,000 tons of CO2 in 2021, but these emissions are not counted. The McNeil code is 589 and you can review EPA emissions data here: https://campd.epa.gov/data/custom-data-download

Burning wood emits almost double the CO2 that would be emitted by burning natural gas to produce same amount of energy. I mention this not to advocate that we replace wood burning with natural gas--we need to replace all burning with solar, wind, nuclear, geothermal--I mention it to point out that replacing fossil fuels with wood will actually increase our greenhouse gas emissions even while the administration excludes these emissions from the inventory. S.5/H.96 incentivizes "advanced wood heating," and the district heat program promoted by Burlington Electric. I ask you to remove incentives, at a minimum, for district heat systems that rely on burning biomass. The Burlington Electric Department's 2020 Integrated Resource Plan indicates that if BED meets in "net zero" goals, it will produce about 1,000,000 tons of CO2 annually.

Please make the following four small changes to H.96:

1. Define *Advanced Wood Heating* as it is used in section 8127
   "Advanced wood heating systems" mean a wood-pellet fueled heating system with a documented efficiency rating of 85% or greater as measured on a Higher Heating Value (HHV) basis for peak rating (not seasonal average) by an accredited third-party, which has a documented emissions for particulate matter below 0.08 lbs/mmBtu for PM2.5, and which complies with all applicable Environmental Protection Agency and Vermont air quality requirements.
2. Define "*Sustainably Sourced Biofuels*" as it is used in section 8127
   Sustainably Sourced Biofuels shall mean biofuels organically sourced on farmland in existence as of the passage of this act that produce no net greenhouse gasses as demonstrated by one-year scope 1, 2, and 3 life-cycle analyses.
3. Strike the "or" in item 8127 d(8) on page 22 so it reads, "noncombustion renewable energy-based district heating systems."
4. Add "solid" to 8127 (f)1 on page 22 so it reads, "To be eligible as a clean heat measure a solid, liquid, or gaseous clean heat measure shall have a carbon intensity value as follows:"

I'll end with a list of peer reviewed scientific analysis and policy papers of the carbon emissions from biomass. I'm a Burlington resident and BED customer and would be willing to act as a witness for your committee.

Finally, by excluding biogenic emissions from the inventory, I do believe ANR is in violation of 10 V.S.A. § 582(g), which reads:

> (g) Greenhouse gas accounting. In consultation with the Department of Public Service created under 30 V.S.A. § 1, the Secretary shall research and adopt by rule greenhouse gas accounting protocols that achieve transparent and accurate life cycle accounting of greenhouse gas emissions, including emissions of such gases from the use of fossil fuels and from renewable fuels such as biomass. On adoption, such protocols shall be the official protocols to be used by any agency or political subdivision of the State in accounting for greenhouse gas emissions. (https://legislature.vermont.gov/statutes/section/10/023/00582)

Thank you for understanding that burning anything, fossil fuels or plants, emits CO2 into our atmosphere and our State needs to push toward clean alternatives.

Pike Porter
Burlington

Scientific Evidence Does Not Support the Carbon Neutrality of Woody Biomass Energy

Summary Conclusions

Based on a comprehensive review of the published scientific literature on forest-derived woody biomass greenhouse gas (GHG) emissions from energy production, we conclude:

• a priori assumptions regarding categorical emissions benefits from forest-derived woody biomass energy production are not supported, and an assumption of "carbon neutrality" is fundamentally flawed.

• There is no scientific basis for the presumed carbon neutrality of biomass from managed forests.

• IPCC Guidelines do not automatically consider biomass used for energy as 'carbon neutral,' even if the biomass is thought to be produced sustainably.

• Carbon impacts of forest-derived woody biomass vary and depend on many established factors (including feedstocks, alternate fate, time horizon and age of the trees used for fuel, production methods, and forest management regimes).

• The assessment of potential GHG emissions associated with woody biomass energy must account for these factors

https://www.tandfonline.com/doi/full/10.1080/00963402.2022.2062933

> But wood emits more carbon dioxide per kilowatt-hour than coal – and far more than other fossil fuels. Therefore, the first impact of wood bioenergy is to increase the carbon dioxide in the atmosphere, worsening climate change. Forest regrowth might eventually remove that extra carbon dioxide from the atmosphere, but regrowth is uncertain and takes time – decades to a century or more, depending on forest composition and climatic zone – time we do not have to cut emissions enough to avoid the worst harms from climate change. More effective ways to cut greenhouse gas emissions are already available and affordable now, allowing forests to continue to serve as carbon sinks and moderate climate change.

https://thebulletin.org/premium/2022-05/does-wood-bioenergy-help-or-harm-the-climate/

> Burning wood to generate electricity emits more carbon dioxide per kilowatt-hour generated than fossil fuels—even coal, the most carbon-intensive fossil fuel. Although wood and coal contain about the same amount of carbon per unit of primary energy—the raw energy in the fuel—(EPA 2018), wood burns less efficiently, in part because it contains more water than coal.

https://nationalpress.org/topic/are-wood-pellets-worse-than-coal/

> Wood pellets produce more greenhouse gases than fossil fuels, as carbon is emitted when wood is harvested, pelletized, shipped and burned. The wood pellet industry has emerged in the American South over the past two decades, as companies use everything from brush in the forests to whole trees and process them into little pellets. The pellets are shipped to plants in the U.K. and elsewhere, where they are burned to generate electricity. While biomass is billed as renewable, burning wood pellets releases more carbon dioxide than burning natural gas, experts said; in addition to the actual burning, carbon dioxide is released during harvesting, drying, debarking, pelletizing and transportation.

https://news.mongabay.com/2021/02/500-experts-call-on-worlds-nations-to-not-burn-forests-to-make-energy/

> Governments must end subsidies… for the burning of wood…. The European Union needs to stop treating the burning of biomass as carbon neutral…. Japan needs to stop subsidizing power plants to burn wood. And the United States needs to avoid treating biomass as carbon neutral or low carbon," says the letter.

https://e360.yale.edu/features/wood_pellets_green_energy_or_new_source_of_co2_emissions

> Burning wood pellets releases as much or even more carbon dioxide per unit of energy as burning coal, so in order for burning pellets to be carbon-neutral the carbon emitted into the atmosphere has to be recaptured in regenerated forests, Abt says. Residual wood, such as tree thinnings and unused tree parts left over at timber mills, is the best material for wood pellets, says Abt. But he and others say that not enough of such waste wood exists to feed the growing demand for wood pellets.
> So the industry has turned to whole trees.

https://www.scientificamerican.com/article/congress-says-biomass-is-carbon-neutral-but-scientists-disagree/

> Lawmakers are once again pushing U.S. EPA and other federal agencies to recognize the burning of biomass as a carbon-neutral energy source. But scientists say that could be a bad move for the climate.

https://www.theguardian.com/environment/2022/dec/05/stop-burning-trees-scientists-world-leaders-cop15-age-of-extinction-aoe

> Burning biomass for energy releases large amounts of carbon into the atmosphere all at once. But depending on the type of tree, forests may take decades or even a century to draw the same amount of carbon back out of the air.

https://www.cutcarbonnotforests.org/scientist-letter-read/

> We, the undersigned scientists, recognize the work that has been done over recent years towards developing a new Global Biodiversity Framework.
>
> We are writing to express our concern regarding an emerging and growing threat to biodiversity that threatens to undermine these commitments: the large-scale use of forest bioenergy to generate electricity and heat.

https://www.pnas.org/doi/10.1073/pnas.1720064115

> We examined the potential for using existing harvest residue for electricity generation, where burning the harvest residue for energy emits carbon immediately (3) versus the BAU practice of leaving residues in forests to slowly decompose. Assuming half of forest residues from harvest practices could be used to replace natural gas or coal in distributed facilities across the state, they would provide an average supply of 0.75–1 Tg C y−1 to the year 2100 in the reduced harvest and BAU scenarios, respectively. Compared with BAU harvest practices, where residues are left to decompose, proposed bioenergy production would increase cumulative net emissions by up to 45 Tg C by 2100.

GHG reduction must happen quickly to avoid surpassing a 2 °C increase in temperature since preindustrial times. Alterations in forest management can contribute to increasing the land sink and decreasing emissions by keeping carbon in high biomass forests, extending harvest cycles, reforestation, and afforestation. Forests are carbon-ready and do not require new technologies or infrastructure for immediate mitigation of climate change. Growing forests for bioenergy production competes with forest carbon sequestration and does not reduce emissions in the next decades.

https://onlinelibrary.wiley.com/doi/abs/10.1111/geb.12747

> The largest 1% of trees in mature and older forests comprised 50% of forest biomass worldwide.

Because large-diameter trees constitute roughly half of the mature forest biomass worldwide, their dynamics and sensitivities to environmental change represent potentially large controls on global forest carbon cycling. We recommend managing forests for conservation of existing large-diameter trees or those that can soon reach large diameters as a simple way to conserve and potentially enhance ecosystem services.

https://www.nature.com/articles/nature07276

> Our results demonstrate that old-growth forests can continue to accumulate carbon, contrary to the long-standing view that they are carbon neutral.

Old-growth forests accumulate carbon for centuries and contain large quantities of it. We expect, however, that much of this carbon, even soil carbon9, will move back to the atmosphere if these forests are disturbed.

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5756473/

Altering forest management to let more trees grow would allow global forests to accumulate twice as much carbon.

https://www.nature.com/articles/s41586-020-2686-x

The potential for growing forests to accumulate carbon by natural regrowth is better than active management and has been underestimated by 32%.

https://www.frontiersin.org/articles/10.3389/ffgc.2019.00027/full
U.S. temperate and boreal forests remove sufficient atmospheric CO2 to reduce national annual *net* emissions by 11%. U.S. forests have the potential for much more rapid atmospheric CO2 removal rates and biological carbon sequestration by intact and/or older forests.

[G]rowing existing forests intact to their ecological potential—termed *proforestation*—is a more effective, immediate, and low-cost approach that could be mobilized across suitable forests of all types.

https://www.cambridge.org/core/journals/global-sustainability/article/unearthing-the-myths-of-global-sustainable-forest-governance/661FE54EF21F34BD75CD874BB28B6B6F

https://www.science.org/doi/10.1126/science.247.4943.699 (or pdf copy)

> Simulations of carbon storage suggest that conversion of old-growth forests to young fast-growing forests will not decrease atmospheric carbon dioxide (CO2) in general, as has been suggested recently. During simulated timber harvest, on-site carbon storage is reduced considerably and does not approach old-growth storage capacity for at least 200 years.