

Memorandum

To: Deirdre Morris and Tom Knauer, Vermont Public Utility Commission

CC: Vermont Clean Heat Standard Technical Advisory Group (TAG)

From: Kevin Ketchman, Joe Plummer, and Zach Ross, Opinion Dynamics

Date: October 9, 2024

Re: Approach to Lifecycle Analysis for Wood Products

On August 29, 2024, Opinion Dynamics shared a draft lifecycle emissions rate schedule with the Vermont Public Utility Commission (“the Commission”) and the Vermont Clean Heat Standard Technical Advisory Group (TAG). Opinion Dynamics subsequently presented this schedule to the TAG on September 19. Prior to, during, and after this presentation, Opinion Dynamics has received a wide range of comments on the approach to lifecycle carbon intensity values for wood fuels (wood pellets, wood chips, commercial firewood, and non-commercial firewood) included in the schedule. This memo 1) summarizes our initial approach, 2) summarizes the comments received to date, 3) provides a response to some of the specific comments shared on the analytic approach, and 4) serves as an official request for TAG guidance on the approach to lifecycle analysis for wood fuels in light of the comments received to date.

#### Summary of Approach

As detailed in our August 29 memo, Opinion Dynamics developed upstream emissions for wood fuels using two sources. For wood chips, wood pellets, and commercial firewood, we used GREET1 2023rev1, following a similar analytical framework as used in the Vermont Energy Sector Life Cycle Assessment report.[[1]](#footnote-1) For non-commercial firewood, we used results presented in the Vermont Energy Sector Life Cycle Assessment report[[2]](#footnote-2) as they are Vermont-specific. We estimated combustion emissions using combustion emissions rates for CO2, CH4, and N2O from the U.S. EPA Emission Factors Hub.[[3]](#footnote-3) Two specific areas of our analysis, the treatment of biogenic carbon for wood fuels and the treatment of land use changes for wood fuels, are worthy of additional comments:

* For wood fuels, we considered CO2 released in combustion to be part of a longer biogenic carbon cycle than biofuels, in which it takes significant time for the regrowth of new trees to fully sequester the biogenic carbon emitted during combustion. In line with an alternative approach presented in the Vermont Greenhouse Gas Emissions Inventory and Forecast,[[4]](#footnote-4) we applied a GWPbio factor[[5]](#footnote-5) to CO2 combustion emissions from wood fuels to account for the regrowth period of the fuel. We applied a GWPbio factor of 0.32 in our analysis. The GWPbio factor was developed independently by Opinion Dynamics using a publicly available World Wildlife Fund biogenic carbon footprint calculator, which is the same tool referenced in the alternative approach presented in the Vermont Greenhouse Gas Emissions Inventory and Forecast.[[6]](#footnote-6) We did not apply a factor in accounting for CH4 and N2O released by combustion of wood fuels in the reported emissions rates.
* For wood fuels, our emissions analysis assumes that there is no change in land use associated with the wood fuel that needs to be quantified in our emissions rates. As described in the Vermont Energy Sector Life Cycle Assessment report,[[7]](#footnote-7) GREET1 2023rev1 models energy and emissions associated with short rotation woody crops with the embedded assumption that these crops are grown for the dedicated use in the energy sector. This assumption is not consistent with typical forestry management strategies in Vermont. Nevertheless, a pathway for accounting for land use changes in Vermont is not evident to us. In addition, the decision to not account for land use change is consistent with the handling of land use change for other biofuels we examined in our analysis.

Table 1 below presents the originally drafted 2025 lifecycle carbon intensity values for wood fuels, separated by combustion and lifecycle phases. Note that the upstream carbon intensity values provided were in schedule form and change a small amount on a year-to-year basis; these values represent 2025 only.

Table 1. 2025 Lifecycle Carbon Intensity Values for Wood Fuels (Initial Draft)

| Wood Fuel | Carbon Intensity Value (gCO2e/MJ) | | |
| --- | --- | --- | --- |
| Combustion | Upstream | Total |
| Wood chips | 29.5 | 1.9 | 31.5 |
| Wood pellets | 29.5 | 25.9 | 55.5 |
| Firewood, commercial | 29.5 | 2.3 | 31.9 |
| Firewood, non-commercial | 29.5 | 0.3 | 29.8 |

*Source: Opinion Dynamics analysis referencing GREET1 2023rev1, Vermont Energy Sector Life Cycle Assessment report, and U.S. EPA 2024 GHG Emissions Factors Hub. Numbers may not add due to rounding.*

#### Summary of Comments Received

Prior to, during, and after the September 19 TAG presentation, Opinion Dynamics received a wide range of questions and comments on the approach to lifecycle carbon intensity values for wood fuels (wood pellets, wood chips, commercial firewood, and non-commercial firewood) included in the schedule. We attempt to summarize those comments below at a high level to provide context around our responses.

##### Comments from TAG Members

TAG members and their invited guests shared a range of questions around our approach to lifecycle analysis for wood fuels. Comments focused largely around the source of wood fuels in the Northeast and whether it is appropriate to treat biogenic carbon emissions from wood fuels differently than biogenic carbon from other fuels.

Multiple TAG members shared the position that wood fuels in the Northeast are derived largely or entirely wholly from wood wastes and that treating these fuels as short-rotation energy dedicated wood crops is inaccurate. TAG members also shared the position that wood fuels in the Northeast should be viewed on a landscape scale rather than at a stand level. TAG members also shared information around forest management practices and shared the position that it is poor forest management practice to “highgrade” (harvest only wood that can be used for non-thermal purposes [e.g. dimensional lumber, furniture, veneers]); and that other wood that can be used only for thermal purposes should be harvested to maintain forest health.

In general, our understanding is that commenting TAG members (which may or may not represent the views of TAG as a whole) believe that the carbon intensity values we provided in our August 29 deliverable overestimate the carbon intensity of wood fuels.

##### Comments from Members of the Public

Numerous members of the public also shared positions on the treatment of wood fuels in our analysis. The specifics of public comments were wide-ranging, but comments generally expressed belief that wood harvesting in Vermont is being completed specifically for thermal purposes, belief that proper scientific and carbon accounting practices for wood products are not being followed in our analysis, and disagreement with the analytical approach used in our August 29 deliverable (including specific disagreements with the approach used to calculate the GWPbio factor applied in our analysis).

Comments suggested a range of approaches, including removing wood products from the CHS altogether, using the U.S. EPA GHG Emissions Factors Hub emissions factors for wood combustion emissions without modification, and using revised GWPbio factors. Specific to GWPbio, members of the public shared the position that the mix of wood species we used to develop this factor was not appropriate for Vermont.

Largely, our understanding is that commenting members of the public believe that the carbon intensity values we provided in our August 29 deliverable for wood fuels are too low and largely that wood fuels should not be used to replace fossil fuels.

#### Response to Analytical Comments and Updates

We appreciate all of the comments received from members of the TAG and members of the public. We respond to a select set of comments below and propose an updated approach.

##### Removal of Non-Commercial Firewood from Analysis

As shared in the September 19 TAG meeting, we plan to remove the separate “firewood, non-commercial” carbon intensities from the emissions schedule. TAG has not provided any comments disagreeing with this choice.

##### Treatment of Wood as a Waste Product

Our initial upstream emissions analysis, using GREET, allocated a share of upstream emissions associated with forest management, harvesting, and lumber milling to wood chips and pellets based on an economic allocation of the value of those products vs. other wood products (e.g. dimensional lumber, etc.).

As documented above, multiple TAG members commented that wood fuels in Vermont should be understood as being derived from wastes rather than purpose-grown/harvested products, and therefore that upstream emissions associated with forest management, harvesting, and lumber milling for these products should be zero to reflect that these products are not driving these activities. Note that some upstream emissions would still be associated with these fuels to reflect other production steps for these fuels.

##### Calculation of GWPbio

As described above, in our first draft of the emissions schedule, we calculated and applied a GWPbio factor of 0.32 to combustion emissions from wood fuels, which assumes a 50/50 split of spruce and pine woods from a cool temperate region using a publicly available World Wildlife Fund biogenic carbon footprint calculator.[[8]](#footnote-8)

As described above, members of the public disagreed with this characterization. In addition, our calculation of this factor does not align with our upstream emissions analysis for wood products, which assumed a mix of maple/beech/birch (hardwoods) in place of spruce. A consistent analysis would have aligned with our upstream analysis. Assuming a 50/50 split of beech and pine would have resulted in a GWPbio of 0.48.

Furthermore, we have received comments from members of the public that indicate a 50/50 distribution of hardwoods and pine is not reflective of Vermont’s forests. We conducted secondary research and identified a report that indicates that 70% of Vermont forests are maple/beech/birch and 7% are spruce/fir.[[9]](#footnote-9) To be consistent with the GREET model’s wood species approach, we recalculate the GWPbio factor with this distribution normalized to 100% for these two species, which leads to a 91/9% mix of beech and pine woods from a cool temperate climate. The resulting GWPbio using these assumptions is 0.75.

Alternatively, members of the TAG have commented that wood fuels should be treated as waste products. Using this assumption, the resulting GWPbio would be 0.00.

##### Proposed Revisions to Approach

Using the information above, we propose a set of revisions to our initially reported carbon intensity values for wood fuels:

* Treat wood pellets and chips consistently as a waste product in our analysis.
  + This choice would set upstream emissions for forest management, harvesting, and lumber milling for these fuels to zero, and would lead to the use of a corresponding GWPbio of 0.00 for these fuels. Upstream emissions associated with waste collection, fuel processing, and transport would still exist for these fuels.
* Treat commercial firewood as a non-waste product.
  + This choice would associate upstream emissions for forest management and harvesting with firewood and would lead to the use of a GWPbio of 0.75 as described above.

Table 2 below presents 2025 lifecycle carbon intensity values for wood fuels following the proposed updates above, separated by combustion and lifecycle phases. Note that the final upstream carbon intensity values will be in schedule form and change a small amount on a year-to-year basis; these values represent 2025 only.

Table 2. 2025 Lifecycle Carbon Intensity Values for Wood Fuels (Proposed Revisions)

| Wood Fuel | Carbon Intensity Value (gCO2e/MJ) | | |
| --- | --- | --- | --- |
| Combustion | Upstream | Total |
| Wood chips | 1.1 | 1.6 | 2.7 |
| Wood pellets | 1.1 | 25.8 | 26.8 |
| Firewood, commercial | 67.8 | 2.3 | 70.1 |

*Source: Opinion Dynamics analysis referencing GREET1 2023rev1, Vermont Energy Sector Life Cycle Assessment report, and U.S. EPA 2024 GHG Emissions Factors Hub. Numbers may not add due to rounding.*

#### Request for TAG Feedback

In light of the comments received to date from members of the TAG as well as members of the public, we are requesting that the TAG provide direct guidance on the approach that should be taken for lifecycle analysis of wood fuels. Specifically, we request that the TAG provide its position on how lifecycle accounting for wood fuels should be completed, including any response to the proposed revised approach we share above.

1. Eastern Research Group, Inc. (2024). Vermont Energy Sector Life Cycle Assessment. Prepared for the VT Agency of Natural Resources. April 30, 2024. [↑](#footnote-ref-1)
2. Ibid. [↑](#footnote-ref-2)
3. U.S. Environmental Protection Agency (2024). 2024 GHG Emissions Factors Hub. Accessed at: <https://www.epa.gov/climateleadership/ghg-emission-factors-hub> [↑](#footnote-ref-3)
4. Vermont Agency of Natural Resources (2024). Vermont Greenhouse Gas Emissions Inventory and Forecast: Methodologies. Accessed at: <https://outside.vermont.gov/agency/anr/climatecouncil/Shared%20Documents/1990-2021_GHG_Inventory_Uploads/_Methodology_Vermont_Greenhouse_Gas_Emissions_Inventory_1990-2021_Final.pdf> [↑](#footnote-ref-4)
5. GWPbio is a global warming potential factor for biogenic carbon [↑](#footnote-ref-5)
6. Our analysis assumed an equal share of spruce and pine woods from a cool temperate region. The GWPbio tool can be found at: <https://files.worldwildlife.org/wwfcmsprod/misc/climate_forest/Biogenic_Carbon_Footprint_Calculator_2020.xlsx> [↑](#footnote-ref-6)
7. Eastern Research Group, Inc. (2024). Vermont Energy Sector Life Cycle Assessment. Prepared for the VT Agency of Natural Resources. April 30, 2024. [↑](#footnote-ref-7)
8. The GWPbio tool can be found at: <https://files.worldwildlife.org/wwfcmsprod/misc/climate_forest/Biogenic_Carbon_Footprint_Calculator_2020.xlsx> [↑](#footnote-ref-8)
9. Public Sector Consultants and Paul Frederick. 2020. Forest Products Industries’ Economic Contributions: Vermont. Accessed at: <https://fpr.vermont.gov/sites/fpr/files/documents/2017%20Forest%20and%20Wood%20Products%20Industries%20Economic%20Contributions.pdf> [↑](#footnote-ref-9)