



Opinion **Dynamics**

VERMONT CLEAN HEAT STANDARD

LIFECYCLE EMISSIONS METHODOLOGY

JUNE 13, 2024



OVERVIEW OF SCOPE

- The core of our work is the development of measure characterizations to support the development and implementation of the Clean Heat Standard (CHS)
- In service of that, our scope is focused on the development of a CHS Technical Reference Manual (TRM)
- Today we'll walk you through our proposed methodology for estimating lifecycle emission factors for the relevant fuels



BACKGROUND

- Act 18 requires the PUC to:
“establish a schedule of lifecycle emissions rates for heating fuels and any fuel that is used in a clean heat measure, including electricity, or is itself a clean heat measure, including biofuels.”
- Lifecycle emissions rates for electricity and fuels are required to characterize the carbon dioxide equivalent emissions reductions that will be produced by clean heat measures and therefore we will be developing these as part of our scope

BACKGROUND

- Act 18 includes a number of explicit requirements for the development of the schedule:

“The schedule shall be based on transparent, verifiable, and accurate emissions accounting adapting the Argonne National Laboratory GREET Model, Intergovernmental Panel on Climate Change (IPCC) modeling, or an alternative of comparable analytical rigor to fit the Vermont thermal sector context, and the requirements of 10 V.S.A. § 578(a)(2) and (3).”

“For each fuel pathway, the schedule shall account for greenhouse gas emissions from biogenic and geologic sources, including fugitive emissions and loss of stored carbon. In determining the baseline emission rates for clean heat measures that are fuels, emissions baselines shall fully account for methane emissions reductions or captures already occurring, or expected to occur, for each fuel pathway as a result of local, State, or federal legal requirements that have been enacted or adopted that reduce greenhouse gas emissions.”

METHODOLOGY

According to SEE Action, strong TRMs are:

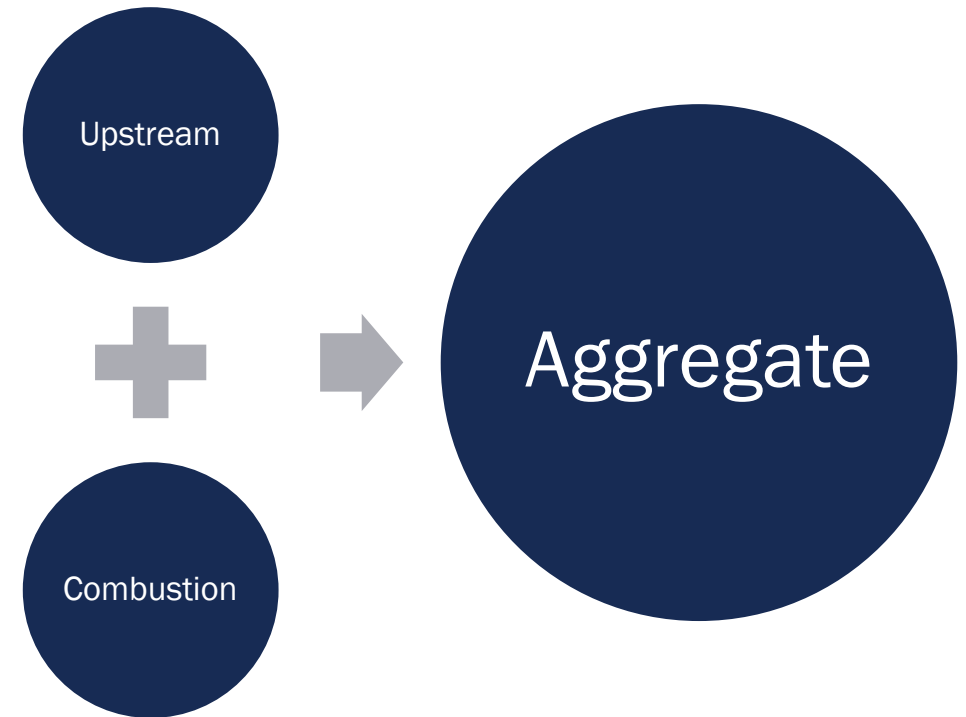
- “(1) well documented with transparent indications of calculations and assumptions (such as data used to derive values) sufficient for others to replicate the values and calculations found in the TRMs,*
- (2) prepared using credible, standardized calculations and data-based assumptions, and*
- (3) designed for ease of operation/compatibility with program tracking and reporting systems.”*



<https://www.energy.gov/sites/default/files/2021-09/emv-trm-report-summary.pdf>

METHODOLOGY

- Upstream emissions reflect the volume of GHG releases resulting from activities upstream of combustion, e.g., resource extraction through transportation of finished fuels to distributors or electricity generation units (EGU)
- Combustion emissions reflect the volume of GHG emissions that are released at the time of combustion of a fuel
- Aggregate emission rates are converted to common units (gCO₂e/MJ) based on the volume of energy that is generated by an EGU or delivered to a delivery agent (e.g., VGS or a fuel wholesaler)

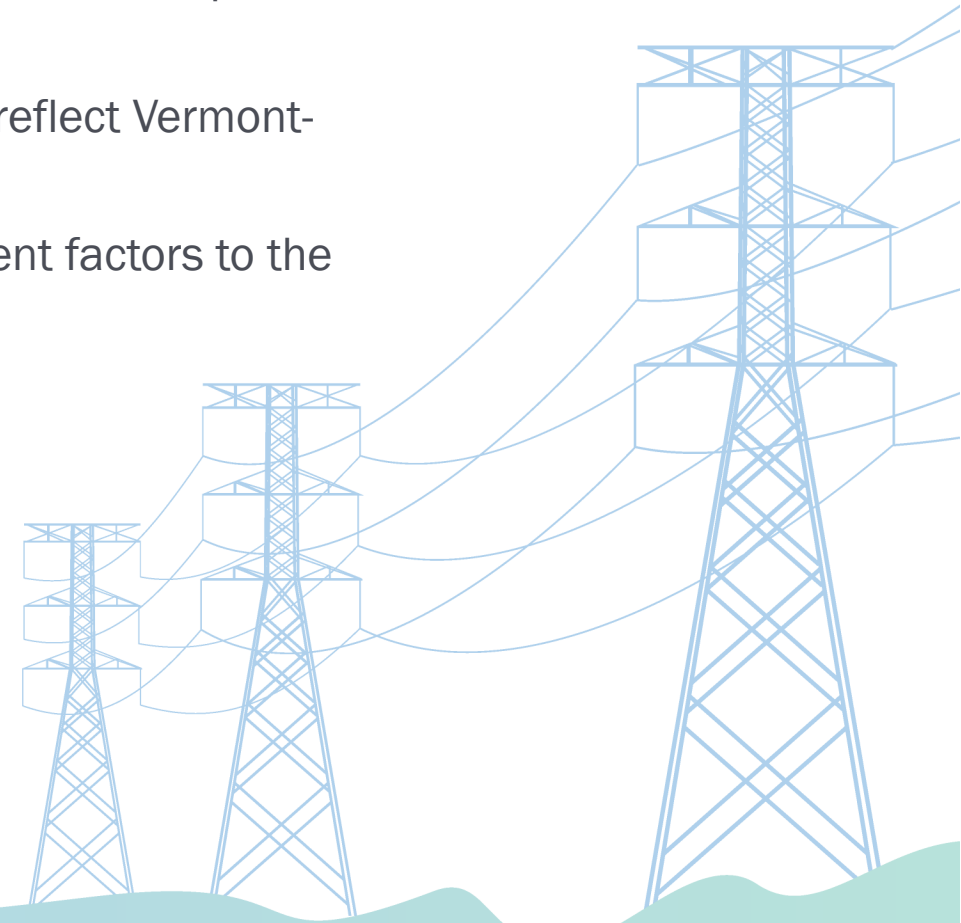


SUMMARY OF OUR APPROACH

Fuels of Interest	Upstream Phase Emissions Source	Combustion Phase Emissions Source	Temporal Adjustments
Grid electricity	AESC 2024	AESC 2024	Vermont RES renewability adjustment factor
Liquid/gaseous fuels	REET1 2023 following <i>VT Energy Sector LCA</i> methodology / framework	U.S. EPA Emission Factors Hub	Static with exceptions for any relevant VT or federal regulations that require changes to existing fuel carbon intensities or pathways
Wood fuels	<i>VT Energy Sector LCA</i>	U.S. EPA Emission Factors Hub	As above

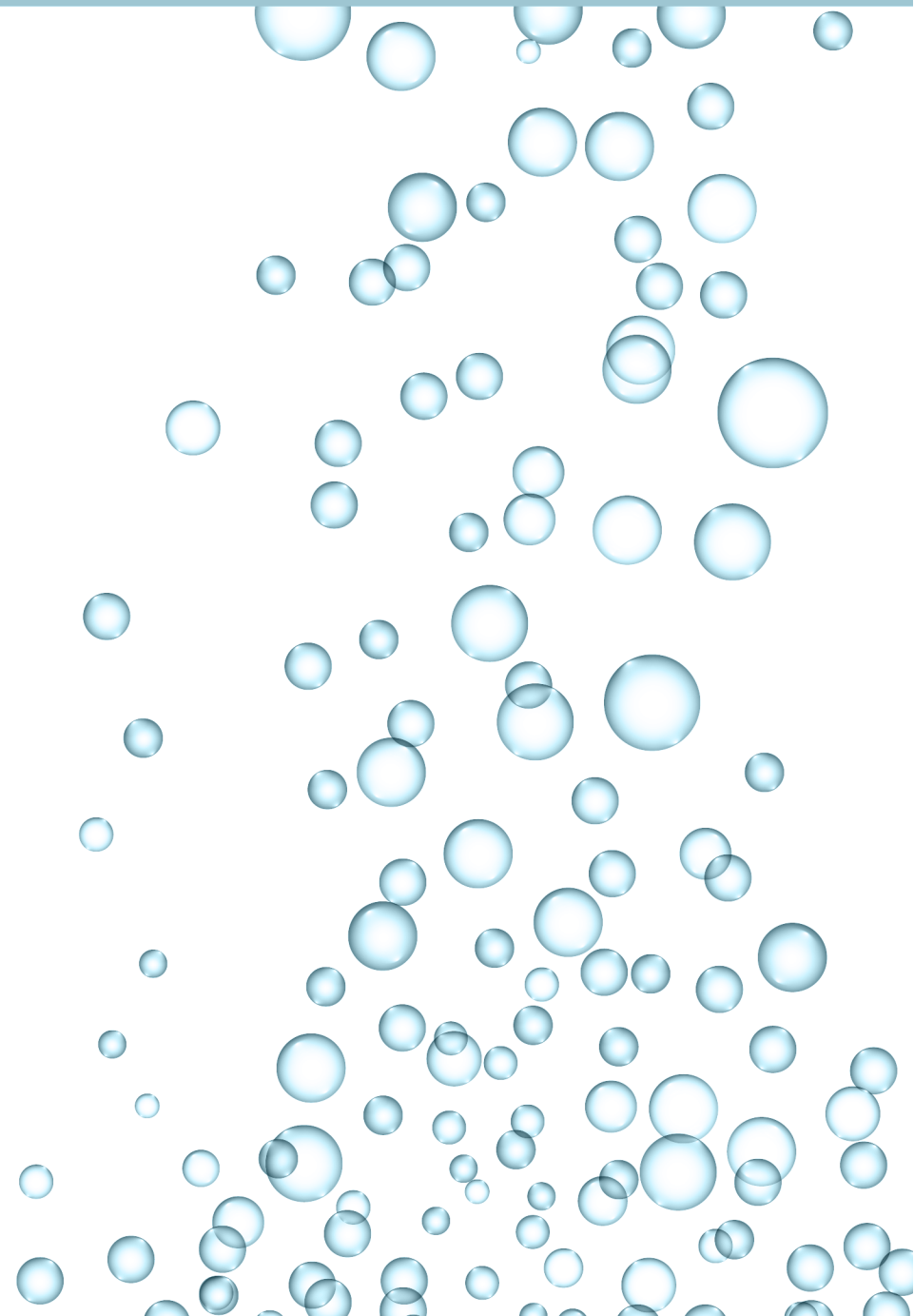
GRID ELECTRICITY

- To determine grid electricity lifecycle emissions rates, we will use the AESC 2024 report, which includes electric grid lifecycle LRMERs for the ISO-NE region
- However, the AESC 2024 report reflects ISO-NE as a whole but does not reflect Vermont-specific characteristics
- To reflect Vermont RES requirements, we will apply renewability adjustment factors to the AESC upstream and combustion LRMERs
- The adjustment factors will separately adjust combustion and upstream:
 - Combustion emissions will be adjusted down to 0 by 2035
 - Upstream emissions will be adjusted to reflect a projected 100% renewable generation mix by 2035, which does still include meaningful upstream emissions
- Final emissions rates will be presented by year (and if possible, by energy period)



LIQUID/GASEOUS FUELS

- For liquid/gaseous fuels, the *VT Energy Sector LCA* presents a framework for estimating upstream emission rates using GREET1 2022
- We will follow the methodology presented in the *VT Energy Sector LCA* using GREET1 2023 to model upstream emissions rates for the fuels included in the study
- For fuels that were not included in the *VT Energy Sector LCA*, we will model upstream emissions rates using GREET1 2023 following the framework presented in the *VT Energy Sector LCA*
- We will combine these upstream emissions rates with combustion phase emissions rates from the U.S. EPA Emissions Factor Hub
- Final emissions rates will vary by year if relevant VT or federal regulations are identified that will lead to future changes; otherwise we expect to present static emissions rates



WOOD FUELS

- For wood fuels, the *VT Energy Sector LCA* presents customized, Vermont-specific upstream emissions factors developed leveraging the Consortium for Research on Renewable Industrial Materials (CORRIM) lifecycle assessment (LCA) for woody biomass
- We plan to use these upstream emissions factors in the emissions schedule, coupled with combustion emissions factors from the EPA hub consistent with other fuels
- We expect to present static emissions rates



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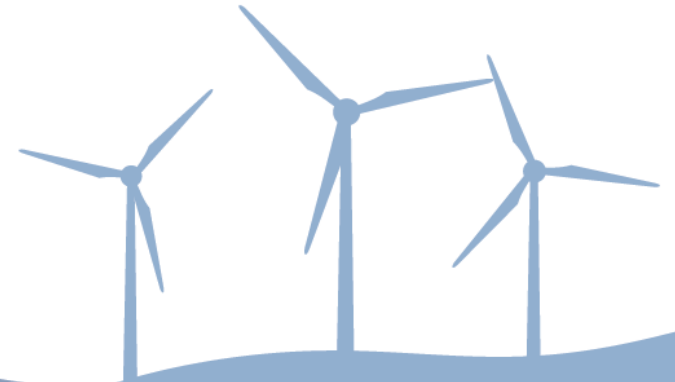
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APPENDIX SLIDES

SOURCES

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- Eastern Research Group, Inc. (2024). Vermont Energy Sector Life Cycle Assessment. Prepared for the VT Agency of Natural Resources. April 30, 2024.
- Synapse Energy Economics, et al. (2024). Avoided Energy Supply Components in New England: 2024 Report. Prepared for the AESC 2024 Study Group. February 7, 2024.
- U.S. Environmental Protection Agency (2024). 2024 GHG Emissions Factors Hub. Accessed at: <https://www.epa.gov/climateleadership/ghg-emission-factors-hub>

LCA Boundary

