

Clean Heat Standard Technical Advisory Group  
 Thursday, 4 April 2024, 9:30-12:30 ET  
 Agenda (Draft)

Meeting Link: <https://cbi-org.zoom.us/j/89637405423>

9:30	<b>Welcome &amp; Review of agenda</b> <ul style="list-style-type: none"> <li>• Initiate recording</li> </ul>	Chair
9:35	<b>Review and approval of <a href="#">3/7/24</a> and <a href="#">3/21/24</a> meeting minutes</b>	Chair
9:40	<b>Updates from the PUC</b> <ul style="list-style-type: none"> <li>• General updates           <ul style="list-style-type: none"> <li>○ Status of revised PUC rule</li> <li>○ DDA selection timeline (if there is any change)</li> </ul> </li> </ul>	Deirdre Morris, PUC
9:50	<b>TAG vacancy discussion</b> <ul style="list-style-type: none"> <li>• What expertise is missing on the TAG?</li> <li>• What is the process if the TAG supports filling the vacancy?</li> </ul> <p><b>Specific action requested of the TAG:</b> Make a motion and vote on whether to ask the PUC to fill the vacancy with specific expertise.</p>	
10:05	<b>DPS CHS Flow Chart</b> (sent in advance) <ul style="list-style-type: none"> <li>• Discussion of additions or possible changes</li> <li>• Process for updating</li> </ul>	TJ Poor, DPS
10:20	<b>Equity Advisory Group Report</b> <ul style="list-style-type: none"> <li>• Response to TAG request on low and middle income (LMI) definition</li> <li>• Other updates</li> </ul>	Emily Roscoe & Matt Cota, EAG liaisons
10:30	<b>DPS Potential Study</b> comments & responses	Matthew Bakerpoole, DPS
10:50	<b>Break</b>	

10:55	<p><b>Breakout groups</b></p> <ul style="list-style-type: none"> <li>• Proposed initial breakout groupsT: <ul style="list-style-type: none"> <li>○ <b>Credit ownership:</b> “establish a standard methodology for determining what party or parties shall be the owner of a clean heat credit upon its creation. The owner or owners may transfer those credits to a third party or to an obligated party.” (Act 18 Sec. 8127 (b))</li> <li>○ <b>Pacing:</b> recommendations on the process of setting and updating the 10-year schedule for the total number of credits to be retired each year. (Commission Order No. 23-2220-RULE)</li> <li>○ <b>Biofuels and biomass life cycle accounting:</b> “establish a schedule of lifecycle emission 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.” (Act 18, Sec. 8127 (g))</li> </ul> </li> <li>• Initial roster and point person for breakouts; call for additional volunteers, if needed.</li> <li>• What is the charge to each group? E.g., <ul style="list-style-type: none"> <li>○ Identify the key questions that need to be answered (including concerns/ questions raised in public comments)</li> <li>○ Identify what the TAG can move on without consultant input</li> <li>○ Identify the information that the TAG needs to answer these questions</li> <li>○ Educate the TAG on the topic by circulating peer-reviewed research or recommending expert speakers</li> <li>○ Review technical consultants’ assumptions / methodologies / results and identifying initial issues for TAG consideration</li> <li>○ If possible, come to the TAG with straw proposals for further consideration</li> </ul> </li> <li>• Role of the public during breakout session</li> </ul>	Chair and Vice Chair
11:05	<ul style="list-style-type: none"> <li>• Move to Breakouts</li> </ul>	
12:05	<ul style="list-style-type: none"> <li>• Report back from breakout groups <ul style="list-style-type: none"> <li>○ Key questions to be answered and next steps</li> </ul> </li> </ul>	Breakout group’s point person
12:15	<p><b>Public Comments</b></p>	
12:25	<p><b>Other Matters</b></p> <ul style="list-style-type: none"> <li>• Agenda topics for next meeting – Thurs., April 18, 9:30 – 12:30</li> </ul>	Chair
12:30	<p><b>Close</b></p>	

**Clean Heat Standard Technical Advisory Group**

**March 7, 2024, DRAFT Meeting Minutes**

Attendees

- Members of the Technical Advisory Group present
  - TJ Poor, Vermont Department of Public Service
  - Jared Ulmer, Vermont Department of Health
  - Brian Woods, Vermont Agency of Natural Resources
  - Matt Cota, Meadow Hill Consulting
  - Luce Hillman, University of Vermont
  - Ken Jones, Individual
  - Michelle Keller, Fraktalas Energy
  - Casey Lamont, Burlington Electric Department
  - Sam Lehr, Coalition for Renewable Natural Gas
  - Emily Levin, Northeast States Coordinated Air Use Management
  - Emily Roscoe, Efficiency Vermont
  - Floyd Vergara, Clean Fuels Alliance America
  - Rick Weston, Individual
  - Patrick Wood, Ag Methane Advisors
- Facilitator
  - Catherine Morris, Consensus Building Institute
- Participating Vermont Public Utility Commission staff
  - Deirdre Morris
  - Dominic Gatti
- Other Participants
  - Matthew Bakerpoole, Vermont Department of Public Service
  - Ben Cartwright, NV5
  - Anthea Dexter-Cooper, Conservation Law Foundation
  - Nick Persampieri
  - Joe Plummer, Opinion Dynamics
  - Pike Porter
  - Zach Ross, Opinion Dynamics
  - Annette Smith, Vermonters for a Clean Environment
  - Matt Socks, NV5
  - Thomas Weiss
  - Bill Wheatle, NV5

Agenda & Actions

- I. Welcome - Chair (5 minutes) [*Time Stamp 0:00:00*]
  - a. Initiate recording
- II. Review of the agenda - Chair (10 minutes) [*Time Stamp 0:00:30*]
  - a. Introduction of the facilitator and her role

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- III. Review and approval of the 2/16/24 meeting minutes – Vice Chair (5 minutes) [*Time Stamp 0:03:17*]

*[Ken Jones moved to approve the February 16, 2024, Minutes. The motion was adopted by voice vote at 9:40 am.]*

- IV. Updates from the PUC (15 minutes) [*Time Stamp 0:04:38*]
- a. General update
  - b. Introduction of technical consultant and SOW
    1. You can find the SOW at <https://puc.vermont.gov/document/clean-heat-standard-technical-consultant-rfp>
- V. TAG Procedures (20 minutes) [*Time Stamp 0:17:28*]
- a. **Discussion:** Roberts Rules vs facilitated discussion; aspirations for strong majority support; open meeting law as applied to subcommittees<sup>i</sup>
- VI. DPS Potential Study – TJ Poor and NV5 (60 min) [*Time Stamp 0:26:45*]
- a. **Questions and Discussion:** Next steps
  - b. Public Comment (10 min)

*[Unresolved: NV5 measure list. There were questions on not explicitly considering burner replacements to accommodate biofuels, renewable fuels from purpose-grown crops, among other measures listed in statute. There was discussion surrounding how costs, non-energy impacts (e.g. health), and time to implement measures would be integrated into the analysis.]*

*[Next Steps: TAG member questions regarding NV5's presentation should be sent to Matthew Bakerpoole by next Friday, March 15. There will also be an ongoing effort to facilitate the expertise of the TAG to inform assumptions being made by the NV5 team.]*

- VII. PUC workshop on Pacing of Retirements – TAG members (15 min) [*Time Stamp 2:13:00*]
- a. Debrief public comments and workshop
  - b. **Discussion:** Should TAG develop recommendations on Pacing?

*[Next Steps: TAG leadership will consider how the TAG can best contribute to the open questions on this topic (e.g. reconciling the use of inventory data and reported fuel tax data, how/when obligations will be tied to sales). TAG will consider a breakout group on this topic, possibly using the Department of Public Service's filing on pacing as a proposal to react to.]*

- VIII. TAG workplan<sup>ii</sup> and schedule – Chair & Vice Chair (30 minutes) [*Time Stamp 2:28:00*]
- a. Formation of subgroups
  - b. Coordinating activities and timelines for TAG, technical and potential study consultants, and PUC proceedings
  - c. **Discussion:** TAG comments on overall schedule

## DRAFT MINUTES

*[The group extended the meeting twice by unanimous consent – once at 12:34 pm to extend to 12:45 pm and again at 12:49 pm to 1:00 pm]*

*[Emily Levin introduced a motion for the group to adopt and send a statement to the Public Utility Commission:*

*The PUC's December 21<sup>st</sup>, 2023, draft schedule for the development and implementation of a Clean Heat Standard rule appears to be infeasible. Several proposed dates for filings and decision have already been missed. The Technical Advisory Group fully appreciates how ambitious the schedule set out in Act 18 is. We nonetheless feel that its key milestones can be achieved in the timeframes envisioned. Failure to meet the procedural deadlines will make it all the more difficult to meet the emissions reduction obligations of the Global Warming Solutions Act.*

*We urge the PUC to develop a revised procedural schedule for the rulemaking as soon as possible. We respectfully suggest that, to increase the efficiency of the process, the PUC consolidate activities where possible, make interim decisions where maintaining overall progress depends on them, and defer any activities upon which a final proposed rule by January 15, 2025 does not depend.*

*The TAG stands ready to assist the PUC in this effort.*

*Clean Heat Standard Technical Working Group*

*7 March 2024*

*Motion amended by TJ Poor at 12:53 pm. Motion to table motion by Brian Woods at 12:59 pm. No objection.]*

- IX. Collaboration with Equity Advisory Group - Chair (5 min) *[Agenda item not reached]*
  - a. **Discussion:** Suggestions for how to coordinate/collaborate with EAG
- X. Other matters - Chair (10 minutes) *[Agenda item not reached]*
  - a. **Discussion:** Agenda topics for next meeting – Thurs., Mar. 21, 9:30 – 12:30
- XI. Public Comment (10 min) *[Time Stamp 3:07:47]*
- XII. Close - Chair (1 minute) *[Time Stamp 3:23:00]*

*[The group adjourned by unanimous consent at 1:00 pm.]*

*Meeting Recording*

<https://youtu.be/q799sxZLh0I>

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<sup>i</sup>As currently interpreted in draft procedures:

The TAG may form subcommittees to effectively delegate the work of the group. Subcommittees fall within the definition of a “public body” [1] and must adhere to the Open Meeting Law.

[2] Subcommittees are responsible for their own scheduling, agendas, and minutes, and must share these materials with Commission staff so that they are posted in accordance with the Open Meeting Law.

[1] 1 V.S.A. § 310(4) “Public body” means any board, council, or commission of the State or one or more of its political subdivisions, any board, council, or commission of any agency, authority, or instrumentality of the State or one or more of its political subdivisions, or any committee of any of the foregoing boards, councils, or commissions, except that “public body” does not include councils or similar groups established by the Governor for the sole purpose of advising the Governor with respect to policy.

[2] 1 V.S.A. § 310(3)(A) “Meeting” means a gathering of a quorum of the members of a public body for the purpose of discussing the business of the public body or for the purpose of taking action.

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<sup>ii</sup> Relevant portions of Act 18

### **§ 8128. Clean Heat Standard Technical Advisory Group**

(a) The Commission shall establish the Clean Heat Standard **Technical Advisory Group (TAG)** to assist the Commission in the ongoing management of the Clean Heat Standard. Its duties shall include:

- (1) establishing and revising the lifecycle carbon dioxide equivalent (CO<sub>2</sub>e) emissions accounting methodology to be used to determine each obligated party’s annual requirement pursuant to subdivision 8124(a)(2) of this chapter;
- (2) establishing and revising the clean heat credit value for different clean heat measures;
- (3) periodically assessing and reporting to the Commission on the sustainability of the production of clean heat measures by considering factors including greenhouse gas emissions; carbon sequestration and storage; human health impacts; land use changes; ecological and biodiversity impacts; groundwater and surface water impacts; air, water, and soil pollution; and impacts on food costs;
- (4) setting the expected life length of clean heat measures for the purpose of calculating credit amounts;
- (5) establishing credit values for each year over a clean heat measure’s expected life, including adjustments to account for increasing interactions between clean heat measures over time so as to not double-count emission reductions;
- (6) facilitating the program’s coordination with other energy programs;

## DRAFT MINUTES

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- (7) calculating the impact of the cost of clean heat credits and the cost savings associated with delivered clean heat measures on per-unit heating fuel prices;
- (8) calculating the savings associated with public health benefits due to clean heat measures;
- (9) coordinating with the Agency of Natural Resources to ensure that greenhouse gas emissions reductions achieved in another sector through the implementation of the Clean Heat Standard are not double-counted in the Vermont Greenhouse Gas Emissions Inventory and Forecast;
- (10) advising the Commission on the periodic assessment and revision requirement established in subdivision 8124(a)(3) of this chapter; and
- (11) any other matters referred to the TAG by the Commission.

(c) The Commission shall hire a third-party consultant responsible for developing clean heat measure characterizations and relevant assumptions, including CO<sub>2</sub>e lifecycle emissions analyses. The **TAG** shall provide input and feedback on the consultant's work. The Commission may use appropriated funds to hire the consultant.

(d) Emission analyses and associated assumptions developed by the consultant shall be reviewed and approved annually by the Commission. In reviewing the consultant's work, the Commission shall provide a public comment period on the work. The Commission may approve or adjust the consultant's work as it deems necessary based on its review and the public comments received. (Added 2023, No. 18, § 3, eff. May 12, 2023.)

### § 8124. Clean Heat Standard compliance

(d) Equitable distribution of clean heat measures.

- (2) Of their annual requirement, each obligated party shall retire at least 16 percent from customers with low income and an additional 16 percent from customers with low or moderate income.

For each of these groups, at least one-half of these credits shall be from installed clean heat measures that require capital investments in homes, have measure lives of 10 years or more, and are estimated by the **Technical Advisory Group** to lower annual energy bills. Examples shall include weatherization improvements and installation of heat pumps, heat pump water heaters, and advanced wood heating systems. The Commission may identify additional measures that qualify as installed measures.

### § 8127. Tradeable clean heat credits

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(b) Credit ownership. The Commission, in consultation with the **Technical Advisory Group**, shall establish a standard methodology for determining what party or parties shall be the owner of a clean heat credit upon its creation. The owner or owners may transfer those credits to a third party or to an obligated party.



**Clean Heat Standard Technical Advisory Group**

**March 21, 2024, DRAFT Meeting Minutes**

Attendees

- Members of the Technical Advisory Group present
  - TJ Poor, Vermont Department of Public Service
  - Jared Ulmer, Vermont Department of Health
  - Brian Woods, Vermont Agency of Natural Resources
  - Matt Cota, Meadow Hill Consulting
  - Luce Hillman, University of Vermont
  - Ken Jones, Individual
  - Michelle Keller, Fraktalas Energy
  - Casey Lamont, Burlington Electric Department
  - Sam Lehr, Coalition for Renewable Natural Gas
  - Emily Levin, Northeast States Coordinated Air Use Management
  - Emily Roscoe, Efficiency Vermont
  - Floyd Vergara, Clean Fuels Alliance America
  - Rick Weston, Individual
- Facilitator
  - Catherine Morris, Consensus Building Institute
- Participating Vermont Public Utility Commission staff
  - Dominic Gatti
  - Deirdre Morris
  - Tracy Myers
- Other Participants
  - Nick Persampieri
  - Joe Plummer, Opinion Dynamics
  - Zach Ross, Opinion Dynamics
  - Thomas Weiss

Agenda & Actions

- I. Welcome & Review of agenda- Chair [*Time Stamp 0:00:00*]
  - a. Initiate recording
  
- II. Review and approval of the 3/7/24 meeting minutes – Chair [*Time Stamp 0:03:00*]

*[Ken Jones requested the March 7, 2024 minutes be revised to include more detail. The revised minutes will be reviewed at the next meeting.]*

- III. Updates from the PUC [*Time Stamp 0:12:00*]
  - a. General update
    - Final TAG Procedures
    - Update on Pacing Workshop follow-up

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- Suspension of DDA schedule by PUC
- Update on legislative action

### IV. TAG's work and schedule [*Time Stamp 0:29:42*]

- DPS Chart on PUC/DPS/TAG/EAG
- Proposal: Creation of breakout groups to meet during the subsequent TAG meeting. Possible topics:
  - Measure characterization, Emissions schedule, & Credit values (EAC)
  - Reconciling lifecycle emissions with inventory emissions
  - Issues related to biofuels, RNG, biomass
  - Pacing
  - Credit ownership
  - Cost impacts, market scenarios
- What is the charge to each group? E.g.,
  - Identify the key questions that need to be answered (including concerns/questions raised in public comments)
  - Identify the information that the TAG needs to answer these questions
  - Identify what TAG can move on without consultant input
  - Educate the TAG on the topic
  - Review technical consultants' assumptions / methodologies / results and identifying initial issues for TAG consideration
  - If possible, come to the TAG with straw proposals for further consideration
- Specific action requested of the TAG:
  - Discuss and agree on the list of topics for breakout groups, which is subject to change / additions as the TAG's work evolves
  - Discuss the charge to each group (vote on a written description of the charge at the next meeting)
  - Solicit volunteers for initial breakout group point person

*[Next steps: TAG leadership to present initial roster and point person for initial 3 groups, clarify what breakout groups are being asked to do and set aside 1 hour for breakout groups to convene.*

*Volunteers for breakout groups: Credit Ownership: Emily Roscoe (or designated Efficiency Vermont representative), Matt Cota, Luce Hillman, and Ben Bolaski (representative from the Department). Schedule/DPS Flowchart: TJ Poor, Rick Weston, Michelle Keller, and Emily Levin.]*

### V. Measure Characterization Consultant Approach – Opinion Dynamics [*Time Stamp 1:30:00*]

- TAG members' questions and comments

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- Public Comment

*[Next Steps: Opinion Dynamics to work on a “statement of coordination” to address concerns of misalignment with Potential Study Consultant, NV5.]*

### VI. DPS Potential Study (NV5) - DPS [Time Stamp 2:13:10]

- Update on comments/questions from TAG members

*[Next Steps: NV5 is currently in the process of reviewing TAG feedback. Goal is to provide responses to the feedback in advance of the next TAG meeting. An updated set of assumptions and parameters are expected at the end of April.]*

### VII. Equity Advisory Group report and process for ongoing collaboration – Emily Roscoe & Matt Cota [Time Stamp 2:24:00]

- Specific action requested of the TAG:
  - Approve Emily Roscoe and Matt Cota to serve as liaisons for EAG
  - Provide input on what they should report on at each meeting

*[Next Steps: Emily Roscoe and Matt Cota confirmed their willingness to serve as EAG liaisons. Ken Jones will draft a memo that asks EAG to further define who is considered a low- and moderate-income customer (e.g. what constitutes a household). Ken Jones will work with Matt Cota and Emily Roscoe to formalize this memo and transmit to the EAG.]*

### VIII. Other matters - Chair [Time Stamp 2:45:00]

- Agenda topics for next meeting – Thurs., April 4, 9:30 – 12:30

*[Next Steps: TAG leadership to review what breakout groups should be formed (in addition to those identified today) and how to frame the topics.]*

### IX. Public Comment [Time Stamp 2:49:30]

### X. Close - Chair [Time Stamp 2:56:00]

*[The group adjourned by unanimous consent at 12:30 pm ET.]*

## Meeting Recording

<https://www.youtube.com/watch?v=e6XenLJtBWw>

## **Memo to the Equity Advisory Group**

### **From the Technical Advisory Group**

#### **Regarding the Definitions and Determination of Low and Moderate Income Households**

**March 25, 2024**

Act 18 includes a requirement that obligated parties retire 16% of the clean heat credits for low income households (“customers with low income”) and another 16% for low and moderate income (“customers with low or moderate income”). The Legislation includes a definition for both low income:

“Customer with low income” means a customer with a household income of up to 60 percent percent of the area or statewide median income, whichever is greater as published annually by the US Department of Housing and Urban Development or a customer who qualifies for a government-sponsored, low income energy subsidy.

And moderate income:

“Customer with moderate income” means a customer with a household income of between 60 percent and 120 percent of the area or statewide median income, whichever is greater as published annually by the US Department of Housing and Urban Development.

While the definitions are clear, there will still be a need to address three factors to translate the definitions to program implementation.

First, the HUD income publication provides different levels of median income for each county. The Legislation notes these differences by citing both the “area or statewide median income”. As a result, there will be different eligibility levels for the different counties. Chittenden, Franklin, Addison and Grand Isle Counties will have higher thresholds for earning LMI credits. This also means that a part of the credit registration process will require information on the county location for the installed measures.

Second, the HUD income publication notes a different value of median income for different household sizes. The PUC will need to determine if Low and Low or Moderate Income qualifying credits should be based on the household size which will require that information to be collected for each potentially eligible credit.

Third, the credit registration process will need to ascertain the income level for the household. Most state programs allow for self reporting of income to meet qualifications. The PUC will need to determine the degree to which verification is required. And, there are, unfortunately, many

possibilities for determining income. For example, the Vermont Department of Taxes collects AGI data from each income tax filer and also collects a different household income figure for those wishing to receive a Renter's Rebate or Property Tax reduction. The verification process may rely on this commonly collected data (requiring an MOU to access the data) or develop its own verification.

In addition, rental properties will have two possible considerations for meeting the Low and Low or Moderate Income credit eligibilities. The income may be based on tenant's income in which case the PUC will need to determine how to evaluate multi unit buildings that will have a mix of tenants' income levels. And, it is possible that the landlord may qualify as low or moderate income in which case the PUC will need to determine if measures carried out in their buildings are eligible for LMI credits.

And finally, there is the possibility that non-residential properties could be considered as possible locations for creating LMI Clean Heat Credits. This may include food shelves, soup kitchens, health clinics, and schools that serve large proportions of lower income households. The PUC may wish to identify the types of buildings that could be considered eligible under Act 18 and establish the mechanism to ensure meeting criteria that match the Legislative language.

The refinement of each of these considerations will be important in order to better understand the potential for meeting the LMI credit requirements which is a part of the charge for the Technical Advisory Group. We are interested in the perspective of the Equity Advisory Group on how these factors should be considered.

# Breakout group assignments

April 4, 2024

## **Biofuels**

Ken North – Point person

Sam Lehr

Floyd Vergara

Patrick Wood

Brian Woods

## **Credit Ownership**

Matt Cota – Point person

Emily Roscoe

Luce Hillman

Rick Weston

## **Pacing**

Michelle Keller– Point person

TJ Poor

Emily Levin


## For Apr. 4, 2024 TAG meeting the point person should:

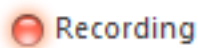
- 1) Start the recording at the beginning of the breakout session to download the recording to your viewing device. (See a separate set of instructions on the next page)
- 2) When you are notified that the recording has been saved (typically in a Zoom folder created automatically in your document folders), save it to dropbox or drive and share the link with Deirdre Morris ([Deirdre.Morris@vermont.gov](mailto:Deirdre.Morris@vermont.gov)). I think the file may be too large to email directly.
- 3) Facilitate the discussion on:
  - a) What are the questions that the TAG needs to address on this topic to provide informed advice to the PUC?
  - b) What are the immediate next steps of the group to begin this work?
  - c) Solicit volunteers to complete tasks between meetings, if appropriate.
- 4) Be prepared to make a brief (3 min) report back to the TAG on the response to **a)** and **b)** above.

## Zoom recording instructions

### How to start a local recording in Zoom Breakout room

Catherine will grant the point person in each breakout the ability to record.

1. Once in your breakout session Click **Record** .
2. If there is a menu, select **Record on this Computer**. Participants will see the following indicator in the top-left corner while the recording is active.



**Note:** [Dial-in participants](#) will hear a message informing them that the meeting is now being recorded unless disabled by the host.

3. After the meeting has ended, Zoom will convert the recording so you can access the files.
4. Once the conversion process is complete, the folder containing the recording files will open.

**Note:** By default, the [recording files are formatted](#) a certain way. The audio/video file (MP4) will be named **video[random number].mp4**. The audio only file (M4A) is named **audio[random number].m4a**.

#### **Note:**

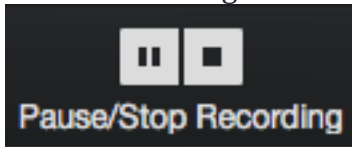
- If the meeting unexpectedly shuts down or if the conversion process is interrupted, the recording files could become corrupted and non-recoverable. Restarting or shutting down your computer, putting the hard disk to sleep, or closing your laptop will interrupt the conversion process.
- If the conversion process is not successful after the meeting has ended, you can try to [manually convert the recording](#).
- After the file has completed converting, if you choose to rename the file from the default naming convention, we recommend you use a unique file name. We recommend you do not use the words **Zoom**, **Personal Meeting Room**, or **My Meeting** when saving your meeting files.

### How to stop or pause a local recording

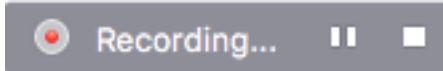
During a Zoom recording, a participant can **Stop** or **Pause** the recording. If a participant stops the recording and starts it again, a **new** video file will be created for the next

recording segment. If a participant pauses the recording and starts it again, Zoom will record to the same video file for the recording segment.

1. After a recording has been started, click Pause or Stop Recording at the bottom.



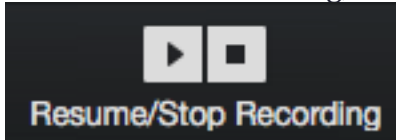
The recording can also be stopped or paused by clicking the indicator in the top left corner.



2. When a recording is paused, the following indicator will be displayed in the meeting.



3. To resume the recording, click **Resume Recording** at the bottom



The recording can also be resumed by clicking the indicator in the top left corner.



4. After you stop the recording, you can [access the local recording files on your computer](#).



## **Staff Proposal: Initial Ownership of Clean Heat Credits**

### **Introduction**

The delivery or installation of clean heat measures for end-use customers in Vermont will create clean heat credits.<sup>1</sup> A clean heat credit is a tradeable, nontangible commodity that represents the amount of greenhouse gas reductions attributable to a particular clean heat measure.<sup>2</sup> A clean heat credit can be divided, traded, transferred, bought, sold, or held until it is retired.<sup>3</sup> Customers and entities are free to enter into contracts transferring ownership of credits as they see fit. We acknowledge that different clean heat measures have different characteristics and distinguish installed measures (e.g., weatherization, heat pumps, etc.) and delivered measures (e.g., biofuels, renewable natural gas, etc.).

Obligated parties consist of a regulated natural gas utility serving customers in Vermont, entities that import heating fuel for ultimate consumption within the state, and entities that produce, refine, manufacture, or compound heating fuel within Vermont for ultimate consumption within the state.<sup>4</sup> The Commission must establish the number of clean heat credits that each obligated party is required to obtain and retire each calendar year.”<sup>5</sup> An “obligated party may seek to meet its requirement, in whole or in part, through one or more of the following ways: by delivering eligible clean heat measures, by contracting for delivery of eligible clean heat measures, or through the market purchase of clean heat credits.” 30 V.S.A. § 8125(d)(1). “All eligible clean heat measures that are delivered in Vermont beginning on January 1, 2023, shall be eligible for clean heat credits.” Section 8127(k).

Pursuant to 30 V.S.A. § 8127(b), the Commission must establish a standard methodology for determining what party or parties will be the owner of a clean heat credit upon its creation.

The Commission has issued orders requesting comment and held a workshop regarding the methodology to apply to the initial credit ownership determination.

Public input included the following suggestions for determining initial credit ownership:

- Clean heat credits would initially go to the installer or deliverer.

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<sup>1</sup> 30 V.S.A. § 8123(3): “Clean heat measure” means fuel delivered and technologies installed to end-use customers in Vermont that reduce greenhouse gas emissions from the thermal sector. Clean heat measures shall not include switching from one fossil fuel use to another fossil fuel use. The Commission may adopt a list of acceptable actions that qualify as clean heat measures.

<sup>2</sup> 30 V.S.A. § 8123(2): “Clean heat credit” means a tradeable, nontangible commodity that represents the amount of greenhouse gas reduction attributable to a clean heat measure. The Commission shall establish a system of management for clean heat credits pursuant to this chapter.

<sup>3</sup> 30 V.S.A. § 8127(k)(2): The owner or owners of a clean heat credit are not required to sell the credit.

<sup>4</sup> 30 V.S.A. § 8123(12).

<sup>5</sup> 30 V.S.A. §§ 8124(a)(1) and 8122(c).

- Clean heat credits would go to the entity, including customers, that induces, pays for, or incentivizes the clean heat measure.

**Clean Heat Credit Ownership Structure, Staff Proposal:**

For the purpose of receiving feedback from the Equity Advisory Group and the Technical Advisory Group, Commission staff offer the following proposal on clean heat credit ownership.

Staff proposes distinguishing initial credit ownership based on whether the clean heat measure was installed or delivered, using the following methodology:

- For installed clean heat measures, end-use customers are awarded all clean heat credits.
- For clean heat measures impacting multi-owner properties, the initial credit ownership will be divided amongst the customers by a pre-arranged agreement.
- For delivered measures, ownership would hinge on the question of who initiated the measure:
  - If a customer opts for the delivered measure (e.g., voluntary purchase of renewable natural gas or higher biofuel blends), the customer will initially own the credit;
  - If a fuel dealer initiates the delivery of a delivered CHM of up to 20% biofuel blend, the deliverer owns the credit;
  - If a natural gas utility initiates the delivery of a delivered CHM of up to the amount of renewable natural gas authorized in its alternative regulation plan, the utility owns the credit;
  - If fuel dealers initiate the delivery of a delivered CHM above a 20% biofuel blend, the fuel dealers must first inform the customer and confirm the customer's heating equipment is able to handle the fuel blend and then the deliverer will own the credit.

**Staff Considerations:**

Commission staff acknowledges that there are multiple reasonable approaches to this decision and has considered, among other things, the following regarding this proposed methodology.

- Customers, installers, and deliverers are the entities at the center of the clean heat standard. Customers may enter into contracts transferring ownership of clean heat credits to the installer or deliverer, a number of whom may also be obligated parties. Customer credit ownership will give customers negotiating power in their contractual agreements with their installer or deliverer, which could result in an exchange of incentives for the credit, likely reducing the cost of the clean heat measure to the customer.
- To ease concerns that customers may be unduly pressured by their installer or deliverer to implement a clean heat measure for credit-creation purposes, the Commission could require installers and deliverers to provide Commission-approved information about the Clean Heat Standard program, alternative technologies and fuels, and information about what programs are available to help pay for measures.

- Awarding proportional credits to every party that supports and/or pays for a clean heat measure: would complicate the initial determination of credit ownership; could create market confusion about ownership; could potentially raise equity concerns; and could complicate subsequent transactions. Allowing credit ownership to originate with the end-use customer is simpler for all parties involved. Note, though, that parties are not prohibited from entering into contracts regarding the ownership of credits, including for an exchange of funds or other incentives or services.

**Specific Requested Feedback:**

Input is now requested from the Technical and Equity Advisory Groups<sup>6,7</sup> regarding Staff's proposed methodology to address initial clean heat credit ownership. Staff specifically seeks feedback on the following questions but welcomes all thoughts on this subject.

- Whether a different methodology should be applied to pipeline renewable natural gas deliveries?
- Whether all credits for installed and delivered measures should be awarded directly to customers?
- Should customers first evaluate and give informed consent to a deliverer-initiated use of a delivered clean heat measure, no matter the blend percentage?
- Whether a different methodology should be applied to clean heat credits for early action clean heat measures?

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<sup>6</sup> 30 V.S.A. § 8127(b): The Commission, in consultation with the Technical Advisory Group, shall establish a standard methodology for determining what party or parties shall be the owner of a clean heat credit upon its creation. The owner or owners may transfer those credits to a third party or to an obligated party.

<sup>7</sup> 30 V.S.A. § 8129(a)(5): providing feedback to the Commission on the impact of the Clean Heat Standard on the experience of Vermonters with low income and moderate income.”

## NV5 RESPONSE TO TAG STAKEHOLDER FEEDBACK

On March 7, 2024, NV5 presented an overview of its initial modeling methodology and measure characterizations to the Clean Heat Standard (“CHS”) Technical Advisory Group (“TAG”) for stakeholder feedback. At the March 7 TAG meeting the Vermont Department of Public Service (“Department”) requested feedback be provided by March 15, 2024. This document 1) describes how feedback will be incorporated, 2) identifies and 3) summarizes the feedback received, and 4) addresses questions received as understood by the Department and NV5.

### I. INCORPORATION OF FEEDBACK INTO THE POTENTIAL STUDY DEVELOPMENT PROCESS

The purpose of the March 7 presentation was to inform—and receive feedback from—stakeholders on the initial draft Potential Study methodology and measure characterizations. Having received feedback, the Department has directed NV5 to modify its Potential Study methodology and measure characterizations as may be appropriate to reflect the feedback received. With this document, NV5 provides its response to the TAG as well as those that provided comments and information directly to the Department’s Clean Heat Standard email.

### II. IDENTIFICATION OF FEEDBACK RECEIVED

A number of parties provided comments and questions as feedback on the Potential Study presentation. This section acknowledges NV5 and the Department’s receipt of feedback:

Date	Party	Org. <sup>1</sup>	Mode	Feedback
20240307	Individual	Self	Email	Greg Doremus Potential Study feedback
20240307	Individual	Self	Email	James Kelly Potential Study feedback
20240307	Individual	Self	Email	James Kelly Potential Study feedback
20240307	EAG	Self	Email	John Mandeville Potential Study feedback
20240307	Individual	Self	Email	Joyce George Potential Study feedback
20240307	Individual	Self	Meeting Chat	Raymond Albrecht comment from 20240307 TAG meeting chat
20240308	TAG	ANR	Phone	Brian Woods Potential Study feedback (phone call)
20240308	TAG	CFAA	Email	Floyd Vergara March 8 Potential Study feedback
20240308	TAG	CFAA	Email	Purdue Biodiesel induced land use changes_Final_V4 (CFAA support material)
20240308	Individual	Self	Email	Renee Carpenter Potential Study feedback

<sup>1</sup> Table Acronyms: Vermont Clean Heat Standard Technical Advisory Group (TAG); Vermont Agency of Natural Resources (ANR); Clean Fuels Alliance American (CFAA); Coalition for Renewable Natural Gas (CRNG); Vermont Fuel Dealer’s Association (VFDA); Efficiency Vermont (EVT); Vermont Gas Systems (VGS)

20240308	TAG	CFAA	Email	xu-et-al-2022-life-cycle-greenhouse-gas-emissions-of-biodiesel-and-renewable-diesel-production-in-the-united-states [VFDA & CFAA support material]
20240311	TAG	CRNG	Email	Sam Lehr Potential Study feedback
20240314	EAG	Self	ePUC	Case No. 23-2220-RULE - Comments Document was filed by John Mandeville
20240314	TAG	VFDA	ePUC	Case No. 23-2220-RULE - Matt Cota VT DPS's CHS Potential Study Assumptions
20240314	TAG	EVT	Email	Emily Roscoe Potential Study feedback
20240314	TAG	CFAA	Email	Floyd Vergara Potential Study feedback
20240314	TAG	CFAA	Email	F[loyd] [V]ergara Notes to Matthew and Fellow Member of the TAG March 13 2024 (FINAL)
20240314	TAG	Self	Email	Ken Jones Comments on the NV5 Clean Heat Standard Potential Study
20240315	TAG	CFAA	ePUC	Case No. 23-2220-RULE - Floyd Vergara Reply Comments to Pike Porter's Reply Comments of 3/14/2024
20240315	EAG	Self	ePUC	Case No. 23-2220-RULE - Pike Porter Reply Comments to Fuel Dealers Association Comments of 3/14/2024
20240315	Individual	VGS	Email	Dylan Giambatista Potential Study feedback
20240315	Individual	Self	Email	Thomas Weiss MC 240316 Potential Study

### III. FEEDBACK SUMMARY

NV5 and the Department appreciate the engagement of all parties who provided feedback, including offers of assistance in collecting data and market modeling. As summarized, feedback received:

- A. Emphasized the need to include all eligible measures in the Potential Study, particularly renewable fuels including liquid biofuels from purpose grown crops and liquified biogas.
- B. Suggested sources or data supporting the carbon intensities of fuels.
- C. Emphasized the need for an equitable and deliberate process to ensure the outcome does not increase costs or result in negative externalities.
- D. Included general opposition to the Affordable Heat Act (2023).

- E. Asked what data sources would be used to characterize measure emissions, such as the carbon intensity of energy sources including fuels (liquid biofuels, biomass, and renewable natural gas) and electricity.
- F. Asked how the low- and moderate-income (“LMI”) measure requirements of the Act would be modeled.
- G. Opposed the use of historic market pricing data and technology adoption projections in the context of recent inflation and higher prices.
- H. Asked whether a credit market would be modeled and whether such modeling is expected to impact modeling results.
- I. Suggested additional measures for consideration including efficient, but not advanced wood heating and on-bill financing.
- J. Proposed implementation methods.

The remainder of this memo speaks to areas of feedback directly relevant to the potential study. For example, general opposition to the Affordable Heat Act is not addressed here, since it is outside of the scope of the Potential study.

A summary of sources for all fuel pathway potentials and emissions is included below:

Fuel	Feedstock	Potential	Emissions
<b>Wood Pellets</b>	Wood	VT GHGI; Billion-Ton Report	VT GHGI
<b>Firewood, Commercial</b>	Wood	VT GHGI; Billion-Ton Report	VT GHGI
<b>Firewood, Non-Commercial</b>	Wood	VT GHGI; Billion-Ton Report	VT GHGI
<b>Wood Chips</b>	Wood	VT GHGI; Billion-Ton Report	VT GHGI
<b>Biomethane</b>	Animal Manure	Billion-Ton Report; VT RNG Potential Study; AGF Study	CARB LCFS-Registered Projects
<b>Biomethane</b>	Landfill Gas	Billion-Ton Report; VT RNG Potential Study; AGF Study	CARB LCFS-Registered Projects
<b>Biomethane</b>	Residues and Waste	Billion-Ton Report; VT RNG Potential Study; AGF Study	CARB LCFS-Registered Projects
<b>Biomethane</b>	Wastewater	Billion-Ton Report; VT RNG Potential Study; AGF Study	CARB LCFS-Registered Projects
<b>Renewable Diesel</b>	Residues and Waste	Billion-Ton Report	CARB LCFS-Registered Projects

<b>Renewable Diesel</b>	Purpose-grown Oil Crops and Waste Oils	EIA SEDS	CARB LCFS-Registered Projects
<b>Biodiesel</b>	Purpose-grown Oil Crops and Waste Oils	EIA SEDS	CARB LCFS-Registered Projects
<b>Hydrogen</b>	Dedicated Renewables	N/A	CARB LCFS-Registered Projects

#### IV. ANSWERS TO CONSOLIDATED QUESTIONS RECEIVED AS UNDERSTOOD BY NV5

In consultation with the Department, NV5 identified specific questions relating to both the Potential Study methodology and measure characterizations. NV5's response to these questions are as follows:

##### 1. How will ANR's Draft Emissions Inventory's upstream values be used?

Based on conversations with the Department and the Vermont Agency of Natural Resources ("ANR"), the potential study proposes to use the ANR Draft Greenhouse Gas Emissions Inventory and Forecast Report, and its combustion emission factors to calculate measure emissions impacts for the non-emerging CHS measures.

The Technical, Maximum Achievable and Economic Potential proposes to specifically use ANR upstream emission factors to represent lifecycle emissions for non-biofuel measures to align with the Clean Heat Standard's emissions definition. The VT GHG inventory combustion emission factors is proposed to be used for the GWSA target scenario to align with how emission factors were calculated for GWSA targets.

Woody biomass and biodiesel (BD) pathway emissions are proposed to be based on the Vermont Agency of Natural Resources (ANR) Draft Greenhouse Gas Emissions Inventory and Forecast Report. In the case of biodiesel, this report has estimated Vermont-specific emission factors for fuel produced primarily out-of-state. Upstream woody biomass emission factors are similarly Vermont-specific but lack the effects of biomass regrowth and decomposition associated with the types of forests from which wood is obtained in Vermont. While these emission factors include contributions from transport and processing, the inventory assumes that the climate change impact of wood combustion is completely mitigated by forest regrowth.

NV5 proposes to use a  $GWP_{bio}$  factor of 0.3 to estimate the climate impacts of the slower Vermont regrowth cycle, based on the currently published Greenhouse Gas Emissions Inventory and Forecast Report and other sources.<sup>2</sup> NV5 proposes to determine wood fuel emissions by multiplying woody biomass combustion emissions by the  $GWP_{bio}$  factor. Vermont's forests have a regrowth cycle on the order of 50-100 years, which corresponds to a  $GWP_{bio}$  factor of 0.13-0.32. The factor range arises from estimating the radiative forcing of wood combustion emissions, which are subsequently reabsorbed by stand regrowth. This is compared to an estimate of radiative forcing arising from combustion emissions from a

<sup>2</sup> Analysis of the Global Warming Potential of Biogenic CO<sub>2</sub> Emission in Life Cycle Assessments. Liu, W.; Zhang, Z.; Xie, X.; Yu, Z.; von Gadow, K.; Xu, J.; Zhao, S; Yang, Y. <https://www.nature.com/articles/srep39857>.

generic fossil fuel that persists in the atmosphere and is not reabsorbed biologically. A GWP<sub>bio</sub> factor of 0.3 was selected as a conservative value.

All other production pathways are proposed to use emission factors from existing California Air Resources Board (CARB) Low Carbon Fuel Standard (LCFS) projects. Each project must use the California GREET (CA-GREET) model to estimate the well-to-wheel lifecycle emissions for its respective fuel pathway in order to qualify for the LCFS program. These lifecycle emissions include emissions for fuel production and transportation. For some pathways, such as animal manure, CA-GREET accounts for avoided counterfactual emissions. Within a given pathway type, qualified projects display a distribution of emission factors, which will be used to select representative emission factors for this study.

**2. Act 18 provides for an enumerated list of measures, some of which were not included in the presentation. Will all eligible measures be included?**

A preliminary measure list was presented in the March 7 TAG meeting which at the time did not represent all the eligible Clean Heat Measures. Below is a more detailed measure list that represents all measure types listed in the Clean Heat Standard and that is proposed to be used in the Clean Heat Standard potential study.

Clean Heat Standard Measure #	Sector	Measure	Feed Stock (Applicable to Fuels Only)
1	RES	Advanced Thermostats	N/A
1	RES	Low Flow Faucet Aerator	N/A
1	RES	Low Flow Showerheads	N/A
1	RES	Envelope Improvements	N/A
1	RES	ERV/HRV	N/A
1	C&I	Advanced Thermostats	N/A
1	C&I	Low Flow Faucet Aerator	N/A
1	C&I	Low Flow Showerheads	N/A
1	C&I	Envelope Improvements	N/A
1	C&I	ERV/HRV	N/A
2	RES	Ground Source Heat Pump – Full Replacement	N/A
2	RES	Ductless Air Source Heat Pump – Full Replacement	N/A
2	RES	Ductless Air Source Heat Pump – Partial Replacement	N/A
2	RES	Centrally Ducted Air Source Heat Pump – Full Replacement	N/A
2	RES	Centrally Ducted Air Source Heat Pump – Partial Replacement	N/A
2	RES	Air to Water Heat Pumps	N/A
2	C&I	Variable Refrigerant Flow (VRF) Heat Pump	N/A
2	C&I	Heat Pump Rooftop Unit (RTU)	N/A
2	C&I	Ground Source/Water Source Heat Pump – Full Replacement	N/A
2	C&I	Ductless Air Source Heat Pump – Full Replacement	N/A



2	C&I	Ductless Air Source Heat Pump – Partial Replacement	N/A
2	C&I	Centrally Ducted Air Source Heat Pump – Full Replacement	N/A
2	C&I	Centrally Ducted Air Source Heat Pump – Partial Replacement	N/A
2	C&I	Air to Water Heat Pumps	N/A
2, 8	All	Networked Geothermal	N/A
3	RES	Heat Pump Water Heater	N/A
3	RES	Heat Pump Pool Water Heater	N/A
3	C&I	Heat Pump Water Heater	N/A
3	C&I	Heat Pump Pool Water Heater	N/A
4	RES	Utility-Controlled Electric Water Heater	N/A
4	C&I	Utility-Controlled Electric Water Heater	N/A
5	RES	Solar Water Heater	N/A
5	C&I	Solar Water Heater	N/A
6	RES	Induction Stovetop	N/A
6	RES	Heat Pump Clothes Dryer	N/A
6	C&I	Induction Stovetop	N/A
6	C&I	Heat Pump Clothes Dryer	N/A
7	RES	Advanced Wood Heating	N/A
7	C&I	Boiler (Advanced Wood Heating)	N/A
7	C&I	Advanced Wood Heating	N/A
9	RES	Wood Pellets	Wood
9	RES	Firewood, Commercial	Wood
9	RES	Firewood, Non-Commercial	Wood
9	IND	Wood Chips	Wood
9	COM	Wood Chips	Wood
9	All	Biomethane	Animal Manure
9	All	Biomethane	Landfill Gas
9	All	Biomethane	Residues and Waste
9	All	Biomethane	Wastewater
9	All	Renewable Diesel	Residues and Waste
9	All	Renewable Diesel	Purpose-grown Oil Crops and Waste Oils
9	All	Biodiesel	Purpose-grown Oil Crops and Waste Oils
10	All	Hydrogen	Dedicated Renewables
11	RES	Efficient and Electric Manufactured Home	N/A
12	C&I	Line Extensions (Custom)	N/A

Note that for Clean Heat Standard Measure #12 “*line extensions that connect facilities with thermal loads to the grid*” the potential study proposes to characterize this as a custom measure due to the varying market scenarios that could be represented under this category. This custom measure will incorporate different scenarios into one modeled line-item. There may be other custom measures necessary within existing Clean Heat Standard measure categories as needed. NV5 will continue to analyze the most representative conditions for Measure #12 and other custom measures as they are identified. Documentation and sources on the make-up of all custom measures will be available upon completion of our measure characterization.

NV5 is also working closely with the Vermont Public Utility Commission (“PUC”) contractor on the Measure Characterization project to ensure that we are aligned as best as possible on measure lists and measure assumptions. A separate Coordination Memo is currently being developed which will document this coordination and include aspects of our measure characterization work where alignment is possible and where alignment may not be possible due to conflicting timelines and the different scopes of each respective project.

### 3. How will the carbon intensity of biofuels/mass be modeled?

Life-cycle emission factors are proposed to be primarily used to characterize each pathway. Because the results of life-cycle emission modeling depend heavily on project location, feedstock type, counterfactual or baseline practices, and renewable fuel end use and sector, NV5 proposes to use archetypes to capture a range of fuel pathway emissions. NV5 intends to primarily use data from existing projects when available. When such data is unavailable, NV5 will use data produced for the state of Vermont.

Oil-based renewable diesel (RD), advanced RD, renewable natural gas (RNG), and hydrogen pathways are proposed to be sourced from the list of currently certified projects for CARB’s LCFS program. This database contains GREET-estimated emission factors for a wide range of project types, so it can serve as a source for a reasonable range of emission factors for biofuel pathways. Where possible, NV5 will attempt to estimate low and high emission factors from a given pathway by approximating the 25th and 75th percentiles of the distribution of observed emission factors for that pathway.

Woody biomass and biodiesel (BD) pathway emissions are proposed to be based on the Vermont Agency of Natural Resources (ANR) Draft Greenhouse Gas Emissions Inventory and Forecast Report. In the case of biodiesel, this report has estimated Vermont-specific emission factors for fuel produced primarily out-of-state. Upstream woody biomass emission factors are similarly Vermont-specific but lack the effects of biomass regrowth and decomposition associated with the types of forests from which wood is obtained in Vermont. While these emission factors include contributions from transport and processing, the inventory assumes that the climate change impact of wood combustion is completely mitigated by forest regrowth.

NV5 proposes to use a  $GWP_{bio}$  factor of 0.3 to estimate the climate impacts of the slower Vermont regrowth cycle, based on the currently published Greenhouse Gas Emissions

Inventory and Forecast Report and other sources.<sup>3</sup> NV5 proposes to determine wood fuel emissions by multiplying woody biomass combustion emissions by the  $GWP_{bio}$  factor. Vermont's forests have a regrowth cycle on the order of 50-100 years, which corresponds to a  $GWP_{bio}$  factor of 0.13-0.32. The factor range arises from estimating the radiative forcing of wood combustion emissions, which are subsequently reabsorbed by stand regrowth. This is compared to an estimate of radiative forcing arising from combustion emissions from a generic fossil fuel that persists in the atmosphere and is not reabsorbed biologically. A  $GWP_{bio}$  factor of 0.3 was selected as a conservative value.

#### 4. What data source is being used for grid carbon intensity and how will electric load growth be modeled?

For grid electric emission factors, NV5 proposes to use the sum of the combustion and upstream marginal emissions rates for the electric sector as modeled in the Avoided Energy Supply Components in New England: 2024 Report. To reflect the hourly variability in electric sector emissions, CHS measure electric energy impacts will be aggregated to four "energy periods" (i.e., Winter On-Peak, Winter Off-Peak, Summer On-Peak, Summer Off-Peak) such that the appropriate marginal emissions rates from AESC 2024 can be applied. Electric load growth will be a function of our overall modeling analysis (i.e., any electrification opportunities will result in increased electric loads). Load growth is also incorporated in utility-supplied load forecasts that are used in combination with our measure characterizations to forecast potential over the model's full time horizon.

#### 5. What data source is being used to estimate supply for each RNG category?

Assumptions for all forms of RNG as well as for advanced RD will be primarily sourced from the Department of Energy 2016 Billion-Ton Report and supplemented by the Vermont Gas Systems (VGS) RNG potential study and American Gas Foundation Renewable Sources of Natural Gas study. NV5 proposes to use the E3 Biofuels Module to set the annual potentials of different types of biofuels. This model allocates biomass feedstocks to final fuels by minimizing net cost, where the net cost is defined as the difference between the total production cost of the renewable fuel and the cost of the fossil fuel that it could replace. The results of this optimization exercise will determine the maximum potential of each final fuel.

NV5 proposes to also assume that anaerobic digestion RNG and advanced RD will be available throughout the entirety of the study period, while RNG produced via thermal gasification will only be available starting in 2030 due to the latter process's current low rate of commercialization.

Oil-based biodiesel and RD are assumed to be mature, scalable fuel pathways. Since Vermont residential, commercial, and industrial (RCI) fuel oil consumption is small relative to national biodiesel and RD consumption, NV5 will consider the practically accessible biodiesel availability for Vermont to be equal to today's RCI fuel oil consumption, derived from the Energy Information Agency's (EIA) State Energy Data System (SEDS).

<sup>3</sup> Analysis of the Global Warming Potential of Biogenic CO<sub>2</sub> Emission in Life Cycle Assessments. Liu, W.; Zhang, Z.; Xie, X.; Yu, Z.; von Gadow, K.; Xu, J.; Zhao, S; Yang, Y. <https://www.nature.com/articles/srep39857>.

Green hydrogen is an emerging clean fuel. However, there is little green hydrogen production with minimum transportation infrastructure today in the northeastern United States. Given its nascent status in the region, we will assume that green hydrogen is unavailable to Vermont until 2028. After that, green hydrogen potential will be limited to blending into Vermont's local distribution gas systems at 7% by energy or 20% by volume. Hydrogen will be assumed to be produced from one of two sources:

1. **Locally in Vermont.** This would entail small-scale hydrogen production sited within or close to local gas distribution systems.
2. **Remote Hydrogen.** Hydrogen could be delivered to Vermont via pipeline from outside of the state. Given the size of the Vermont market, this would likely require a more substantial build-out of hydrogen infrastructure both upstream and within New England to be feasible. For modeling purposes, NV5 proposes to assume that additional green hydrogen will be produced in Western Pennsylvania with wind resources, stored in salt caverns in Western Pennsylvania, and transported in dedicated hydrogen pipelines to Vermont.

Woody biomass potentials will be based on a mixture of (1) current woody biomass consumption, derived from the Vermont Agency of Natural Resources Draft Vermont Greenhouse Gas Emissions Inventory and Forecast Report, and (2) forest residues from the Billion-Ton Study and (3) the 2022 Updated Advanced Wood Heat Sector in Vermont and Wood Heat Use in Vermont reports. In-state woody biomass, such as forest residues and thinnings, will be assigned to wood chip and pellet production. This biomass will be allocated to wood chip and pellet potential, proportional to today's in-state wood chip and pellet consumption. The largest of the woody biomass potential from (1) and (2) is proposed to be used to estimate the potential of wood pellets, wood chips, and firewood.

## 6. How will LMI measures be modeled?

The CHS Potential Study will incorporate analysis to determine impacts on LMI households with high energy burdens, manufactured homes, and renter households with tenant-paid energy bills. Many of the measures identified in the measure list above (IV.2.) will be applicable to the LMI sector and will be modeled assuming some type of program intervention covers up to 100% of the measure costs for LMI customers in the program achievable scenarios. Incentives for market rate customers will be modeled to cover a lower percentage (to be determined based on alignment with current programs and feedback from the Equity Advisory Group ("EAG")) of measure costs. Furthermore, LMI will be modeled as a specific market segment in the analysis.

NV5 is also conducting a review of Workforce Development regarding the current state of workforce as well as a forecast of workforce needed to support the CHS to determine potential gaps in workforce capacity between the current-state and future-state workforce needed to support potential study results. This analysis will include coordination with Vermont regional trade organizations (e.g. Heating & Cooling Contractors of Vermont and Vermont Fuel Dealers Association) and trade schools (e.g. Vermont Technical College, Green Mountain Technology and Career Center) to supplement any quantitative data from existing secondary VT workforce reports or analysis. This coordination will provide further insight on

hiring or enrollment trends that will inform both current state conditions as well as highlight any barriers or difficulties in job market capacity. NV5 will also review federal and state policy relating to clean energy workforce development to help complete the overall current-state workforce landscape.

Finally, NV5 will be working with the EAG to get feedback on our project and our LMI approach and will be discussing this project in more detail in an upcoming April EAG meeting.

**7. Will assumptions about the market for clean heat credits be made and are those assumptions expected to impact model results?**

NV5 will incorporate assumptions on market conditions that impact Clean Heat Standard measure adoption including fuel sales forecasts, disaggregation of fuel sales forecast by fuel type and sector, customer counts and demographics, and other general baseline market characteristics. NV5 will not incorporate assumptions about clean heat credit market value as that is outside of the scope of the potential study project.

**8. What data source will be used for measure cost and how will it account for inflation?**

NV5 will be using measure costs from the 2023 Vermont Energy Efficiency Utility TRM and the Tier III TRM as these represent the best available existing cost data at the time of this project. All measure costs will be reviewed and verified and for those measures where NV5 determines that existing cost sources may not represent current market conditions, supplemental data may be used. NV5 will also be applying inflation values to measure costs.

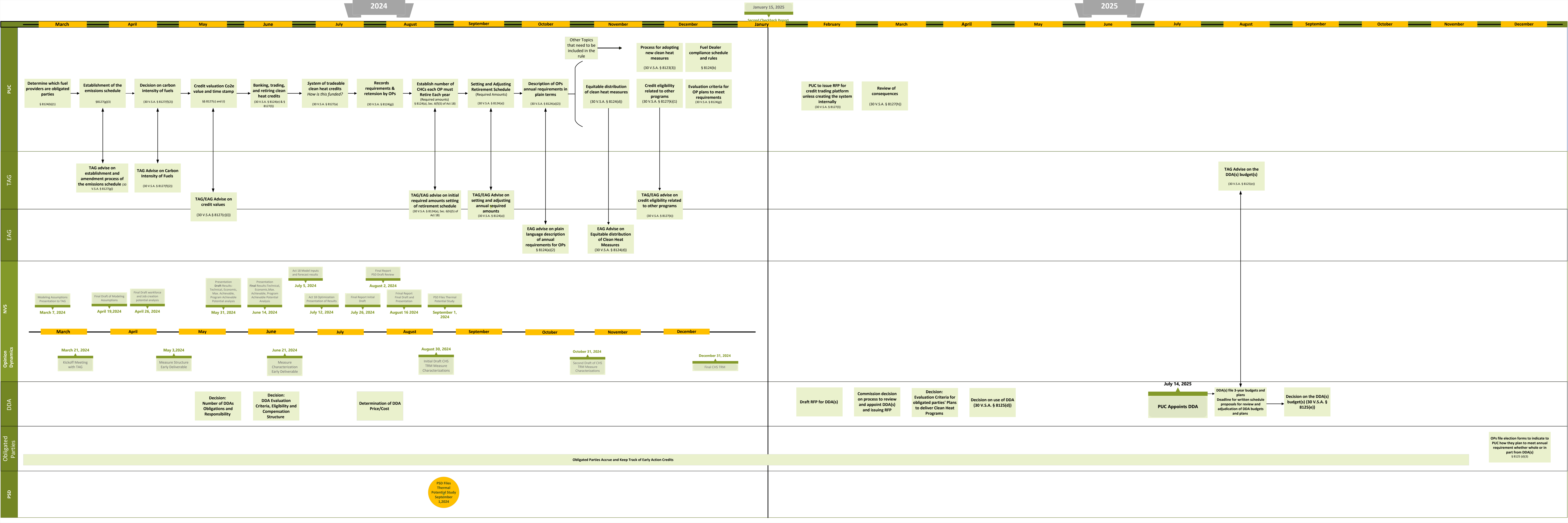
**9. How will measure loading order be modeled and will weatherization be loaded first?**

The potential study uses loading orders to determine which technologies are given priority in each building type and application. This order could be based on factors such as the lifecycle emissions reductions, cost effectiveness ratios, customer economics, and/or policy priorities. NV5 will be considering the benefits of weatherization as one of the considerations in prioritization.

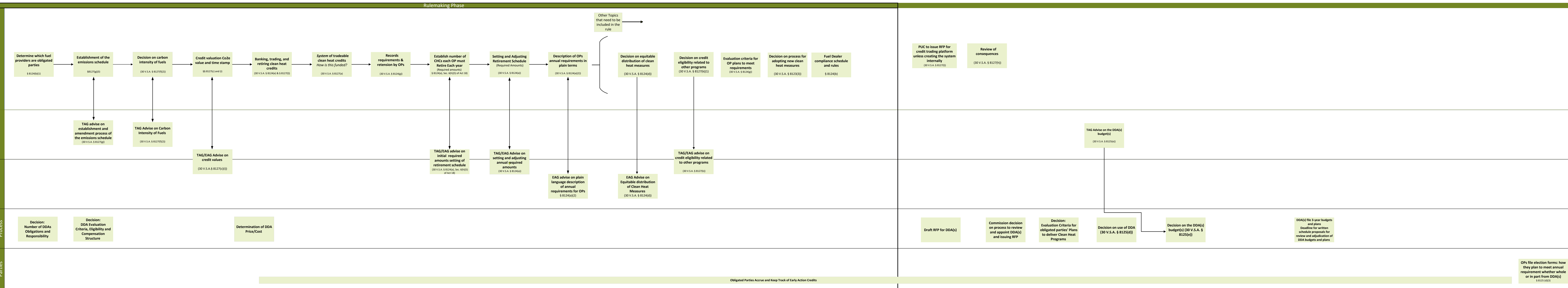
**10. How are measures that can easily be undone (aerators) going to be modeled?**

There are several ways to model measures that are easily undone. An “in-service rate” can be used if it’s quantified in the TRM algorithm for measures that were installed via a kit. This factor assumes a certain percentage of kit items like aerators don’t ever get installed. For direct install measures, a lower adjusted measure life can account for uninstalled measures. Finally, some measures will have net-to-gross factors which also account for the early uninstallation of a measure. NV5 will work with the Department to determine which method is appropriate for these types of measures.

NV5 and the Department thank all commenters for participating in the development of the Potential Study modeling inputs and parameters. The Department will provide an updated working version of the Potential Study methodology and measure characterization memo to the TAG, and on its Clean Heat Standard web page on or before April 30, 2024.



Rulemaking Phase



# Opinion Dynamics

PUC Technical Consultant

2024

# NV5

PSD Thermal Potential Study

Kickoff Meeting with TAG

March 21

March 7

Modeling Assumptions to TAG

April 19

Final Draft of Modeling Assumptions

Measure Structure Early Deliverable

May 3

April 26

Final Draft Workforce and Job Creation Potential Analysis

May 31

*Presentation Draft Results: Technical, Economic, MAX. Achievable Potential Analysis*

Measure Characterization Early Deliverable

June 21

June 14

Final Results: Technical, Economic, Max. Achievable Potential Analysis

July 5

Act 18 Modeling inputs and Forecast Results

July 12

Act 18 Optimization Presentation of Results

July 26

*Final Report Initial Draft*

August 2

Final Report PSD Draft Review

August 16

*Final Report Final Draft and Presentation*

First Draft CHS TRM Measure Characterizations

August 30

September 1

PSD Files Thermal Potential Study

Second Draft CHS Measure Characterizations

October 31

Final CHS TRM

December 31