8/31/2026

24-2797-PET

Commissioners,

Vermont law imposes three distinct efficiency-related requirements on new in-state woody biomass electricity facilities through two distinct statutes. First, under 30 V.S.A. §248(b)(11)(B), the Commission must find that a facility, "achieve[s] the highest design system efficiency that is commercially available, feasible, and cost-effective." This is a maximization standard, not a minimum threshold. Second (and third), under Vermont Act 179 of 2024, a new woody biomass facility must achieve at least 60% overall efficiency and also demonstrate at least a 50% net life-cycle greenhouse gas (GHG) emissions reduction relative to a new combined-cycle natural gas plant in order to qualify under Vermont's Renewable Energy Standard.

The facility as proposed by VRG fails to meet any of the three Vermont requirements.

- The facility will *increase* net greenhouse gases by 133% over the baseline. As explained more fully below. This conclusion rests upon data VRG submitted for its air quality permit and entered into the EPA CHP emissions calculator. The EPA CHP resource center is here: https://www.epa.gov/chp.
- The facility *does not* "achieve the highest design system efficiency that is commercially available, feasible, and cost-effective." According to the EPA (https://www.epa.gov/chp/chp-benefits), "CHP systems typically achieve total system efficiencies of 65 to 80 percent. Some systems achieve efficiencies approaching 90 percent." As explained more fully below, a facility using recovered heat internally does not meet FERC's "productive and beneficial" energy test, cannot meet "highest design system efficiency," and makes no meaningful contribution to either the "public good," or the "general good of the state."
- The claim of "60% overall efficiency" made by VRG does not hold up under scrutiny. Exhibit VRG-AS-8 is designed to obscure the methodologies, calculations, and documents, that, upon review by the Commission, will demonstrate double counting of energy outputs and under-counting of energy inputs.

Before the Public Utility Commission issues a certificate of public good as required under subsection (a) of this section, it shall find that the purchase, investment, or construction: (5) With respect to an in-state facility, will not have an undue adverse effect on aesthetics, historic sites, air and water purity, the natural environment, the use of natural resources, and the public health and safety, with due consideration having been given to the criteria specified in 10 V.S.A. §§ 1424a(d) and 6086(a)(1) through (8)

and (9)(K), impacts to primary agricultural soils as defined in 10 V.S.A. § 6001, and greenhouse gas impacts. (30 V.S.A. § 248)

Useful, Productive, and Beneficial Energy

Vermont Renewable Gas (VRG) submitted Exhibit VRG-AS-8, a one-page certification letter from Jerry L. Marshall, P.E. of Engineering Services of Vermont, dated August 14, 2024. That letter concludes that VRG's facility achieves a "Plant Overall Efficiency" of 62.38%, thereby meeting both the §248(b)(11)(B) standard and Act 179's 60% requirement.

In support of this certification letter, Alexander Skorokhodov, at timestamp 2:48:03 in part 1 of the evidentiary hearing recording, makes this statement: "According to regulations we can account not only electrical power, but heat power as well. That's what is done here." Moments later, in answer to the question, "So this is energy just used on site, correct?" Mr. Skorokhodov states, "Yeah. Useful energy, I would say it. So the using of heat energy for biomass drying and for driving this small steam turbine, sea turbine qualified as a useful energy."

The term "useful energy" is not used in any Vermont rules or statutes (that I am aware of), and "overall efficiency" as used in statute is not defined. Thus, it is necessary look to other sources to understand Mr. Skorokhodov's comments and determine how the Commission should understand "useful energy," and "overall efficiency." The term "useful energy" is used by the EPA to help understand and calculate CHP facilities. The Federal Energy Regulatory Commission (FERC), which "finds that "productive and beneficial" is nearly synonymous with "useful,"" uses a "productive and beneficial" test to weed out "sham" thermal energy output claims.

In 2006, the Federal Energy Regulatory Commission issued Order 671, *Revised Regulations Governing Small Power Production and Cogeneration Facilities Docket No. RM05-36-000*" to address the issue of "useful energy." The Order revoked the "presumptively useful" standard[1] and replaced it with a "productive and beneficial" test. "The Final Rule accordingly will require an applicant to demonstrate that a new cogeneration facility's thermal output is used in a productive and beneficial manner." The Order further explained that:

> The Commission will examine the use of a cogeneration facility's thermal output to assure that the use is not a "sham," and that the thermal output is used in a "productive and beneficial manner." In determining whether the thermal output is used in a "productive and beneficial manner," the Commission will consider factors such as whether the product produced by the thermal energy is needed and whether there is a market for the product.
>
> Our interpretation of the meaning of "productive and beneficial" in the context of cogeneration is that there is a real, genuine need for the thermal output of the facility.

[1]It is interesting to note that one of the only comments opposing the revocation of the "presumptively useful" standard came from the American Forest and Paper Association, which perhaps recognized that bogus wood-chip drying technology would not meet the new standard.

The Vermont Public Utility Commission should adopt the same test. When it does, it will conclude that VRG facility's thermal output is a sham. Application of the test:

> *Is there a need for the thermal energy produced by the VRG facility?* No. VRG artificially creates both the need and the product to satisfy the need. Absent the facility itself, there is no need for the wood chip dryer, the dried wood chips, or ORC turbine generated electricity.
>
> *Is there a market for the product?* No. VRG has not attempted to market the product, and there is no conceivable way VRG could sell dried wood chips for a profit. ANR, in its emergency Finch petition, acknowledges that there is a glut of low value wood and limited market for it. CETY, VRG, and Synergy Bioproducts have been promoting the proposed biomass facility as a market for, not a producer of low value wood: https://cetyinc.com/news/press-release/pulp-mill-closure-incentivizes-developing-alternative-vermont-forestry-markets/

VRG's recovered heat calculation is a sham as defined by FERC. The recovered heat produces no commercially valuable external output. Drying biomass feedstock prepares it for the pyrolysis process in order to produce electricity. The recovered heat *may* reduce VRG's own operating costs and *may* be integral to the entire electric generation process but it delivers no product or service to any external party. Generating additional internal electricity via the ORC turbine similarly cycles value back into VRG's own operations. Neither use creates the kind of externally directed beneficial output that Congress intended when it defined cogeneration facilities.

For all intents and purposes, energy that is used only internally without producing an actual marketable product, does not meet the FERC definition of "productive and beneficial," and should not be considered as part of the "overall efficiency" of the facility.

"60% overall efficiency" Or Double Counting?

Exhibit VRG-AS-8 is clearly a cover. Mr. Marshall, writes in his certificate, "We have reviewed the documentation provided to us, produced by CETY and dated 29/09/2023 for the VRG project." Yet, the documentation referenced in the certification has been withheld by the petitioner. Why? In place of the documentation, the certification provides a single table derived from documentation produced by CETY, VRG's technology licensor, dated September 29, 2023. Mr. Marshall's table and the resulting efficiency calculation are as follows:

Line Item	Energy In (kWh)	Energy Out (kWh)
Thermal Biomass — 2,500 kg/hr @ 46% moisture	6,175	—
Electric — 3 Gensets	—	2,200
Electric — Internal consumption ORC	—	140

generator		
Thermal — 3 Gensets & ORC Generator heat recovery	—	1,512
Totals	6,175	3,852
Plant Overall Efficiency		62.38%

I am not an engineer, yet I can certify the numbers are correct. Any 6th-grader could certify that the math is correct. The arithmetic is internally consistent: 3,852 ÷ 6,175 = 62.38%.

This fact in no way, shape, or form, however, confirms that the proposed facility meets an overall efficiency of 62.38%. We cannot determine the efficiency without better understanding the output column: what was omitted, and how it was allocated.

The output column contains three entries: 2,200 kWh of electricity from the three Guascor engines, 140 kWh of electricity from the ORC turbine (explicitly labeled "internal consumption"), and 1,512 kWh of recovered thermal energy. Together these sum to 3,852 kWh.

However, the electricity that actually reaches the grid, *the only actual output this facility produces*, is only the first two items:

Grid-delivered electricity: 2,200 + 140 = 2,340 kWh

Electrical-only efficiency: 2,340 ÷ 6,175 = 37.9%

The remaining 1,512 kWh is recovered heat that stays inside the facility, used to dry incoming biomass and to run the ORC turbine. Without that thermal credit, VRG's efficiency falls nearly 25 percentage points below the 60% Act 179 threshold. The thermal credit is essential to meet the threshold.

Counting recovered heat as a "useful output" is a recognized methodology in combined heat and power (CHP) accounting, ***but only when that heat is delivered to an external beneficial use*** like heating a district heating system, or creating a marketable product. Here, the heat remains entirely within the facility's own operations. The certification does not cite any Vermont regulatory standard, ISO protocol, or EU CHP Directive methodology that specifically authorizes counting internally consumed heat as a qualifying output under Act 179 or §248(b)(11)(B). Moreover, the certification letter itself provides no methodological explanation for the 1,512 kWh thermal figure and does not explain how the heat routed to the ORC was allocated between the two output categories. Without that breakdown, the Commission cannot determine whether the total output of 3,852 kWh represents genuinely distinct energy streams or whether some portion of the thermal credit and the ORC electrical credit represent the same BTUs counted twice. If the heat driving the ORC were properly removed from the thermal credit before that credit was calculated, the thermal line would be smaller, total output would fall, and the 62.38% figure would decrease. By how much depends on the actual

thermal split between biomass drying and ORC input, information that VRG refuses to provide.

Because the CETY source document has not been filed in the public record, neither the Commission nor any party can evaluate the assumptions on which the 62.38% figure rests:

- What moisture content did CETY assume for the biomass at the point of energy measurement — pre-drying or post-drying? This choice significantly affects the calculation.
- What engine thermal efficiency did CETY assume for the three Guascor gensets? Manufacturer specifications at rated load often differ substantially from real-world operating averages.
- What temperature and flow rate assumptions underlie the 1,512 kWh thermal recovery figure? Heat recovery at lower temperatures has reduced thermodynamic value.
- Is the ORC output of 140 kW based on measured performance at a comparable installation or on manufacturer's nameplate specifications?

A one-page efficiency certification built on unverifiable, self-interested inputs does not constitute an independent engineering determination or satisfy the requirements of Act 179. The Commission should require VRG to produce the underlying CETY documentation so that its assumptions can be reviewed by the public, Commission staff or an independent expert.

Mr. Skorokhodov testified that the facility's waste heat serves two purposes: drying incoming wet biomass before pyrolysis, and driving the ORC turbine to generate 140 kWh of additional electricity. This creates a potential double-counting problem. If the same waste heat stream that powers the ORC turbine is also included in the 1,512 kWh thermal credit, then the energy value of that heat is being counted twice:

- Once as the source of the 140 kWh ORC electrical output (credited in the electricity row), and
- Again as part of the 1,512 kWh recovered thermal energy (credited in the heat row).

The ORC output is labeled "internal consumption" in the table, confirming that the facility uses at least some of its own generated electricity. Yet the table contains no corresponding entry on the input side reflecting that internal power use. Without proper accounting, we are uncertain if energy is double counted on the output side or under-counted as an input. A proper efficiency calculation uses net output: gross generation minus parasitic consumption.

If the 140 kWh ORC output powers the facility but is counted as electrical output without a matching deduction for internal power use elsewhere, the net effect is to inflate both the output and overstate the facility's actual efficiency. The certification should show gross generation and parasitic consumption separately so that net efficiency can be independently verified. A proper CHP efficiency analysis allocates each energy stream

to a single output category. The certification should identify the thermal flow to the ORC separately and confirm it is not simultaneously credited as recovered heat.

A proper CHP efficiency standard credits waste heat because it displaces energy that would otherwise have to be generated or purchased elsewhere. When the heat merely reduces the plant's own operating costs, the societal energy benefit is zero, and a different accounting treatment is warranted. Namely, the energy output identified as a credit must be offset by the energy input used to generate the credit. The two cancel out. A facility designed and built solely to use recovered heat internally clearly does not promote the general good of the state.

Greenhouse Gas Requirement Is Unaddressed

The decision in Docket 7833 re: the North Springfield Sustainable Energy Project should be considered in the instant case:

> Additionally, the State has established statutory goals for reducing greenhouse gas emissions in Vermont from the 1990 baseline, including reductions of 25 percent by January 1, 2012, 50 percent by January 1, 2028, and if practicable using reasonable efforts, 75 percent by January 1, 2050.
>
> The record in this case supports a finding that operation of the Project would interfere with the State's ability to meet these statutory goals as a result of the large annual releases of greenhouse gases that would result from combustion of the wood fuel. Use of a natural resource at the expected thermal efficiency level, which would in turn result in impacts that are contrary to the State's legislated policy goals, would not promote the general good of the State.
>
> We agree with NSSEP that the version of § 248 applicable in this proceeding does not expressly require a carbon accounting. However, it is still NSSEP's burden to demonstrate that operation of the Project would promote the general good, and this it has failed to do. NSSEP's own witness, Mr. Ingold, acknowledged that it was important to understand when the Project would have a beneficial carbon outcome, and admitted that NSSEP had not undertaken any analysis to reach that understanding. (from 7833 Final Order)

The Marshall certification letter does not address greenhouse gases or compliance with Act 179 with respect to greenhouse gases. Evan Dell'Olio testified at the evidentiary hearing that VRG has not completed a greenhouse gas life cycle analysis. His testimony was unambiguous: "We have not completed a greenhouse gas life-cycle analysis."

Mr. Skorokhodov mentions CO_2 in his testimony beginning at timestamp 2:48:12:

> Attorney Cliburn: Okay. Just last question or two. You testified in your prefiled testimony Alexander that particulate matter is filtered out of gas in the pyrolysis process in this deployment of technology. What happens to that particulate matter?
>
> *Mr. Skorokhodov: After the gas comes to the generator engine and its burned in the engine basically, it produces exhaust. And exhaust consists of CO_2 mainly but also some other components like NOx, CO, and water. And in order to fulfill air quality requirements we install so called SCR module on exhaust. SCR is selective catalytic reduction system. It means it consists of two main parts. The first is catalytic reduction of CO, carbon monoxide, to CO_2. So its basically oxidation of CO_2.*

To be clear, Mr. Skorokhodov claims the primary exhaust is CO_2. Additionally CO produced by the pyrolysis process passes through the selective catalytic reduction system where CO is combined with oxygen to produce more CO_2, which is then also exhausted into our atmosphere.

I have performed a greenhouse gas analysis on behalf of VRG. The Environmental Protection Agency (EPA) offers information about CHP facilities at: https://www.epa.gov/chp. It also offers Excel based CHP emissions calculator at: https://www.epa.gov/chp/chp-energy-and-emissions-savings-calculator.

The proposed facility does not meet the threshold. In fact, it misses the threshold by 183%. I did not include any additional CO_2 pollution created and exhausted by the SCR.

The GHG Calculation — Step by Step

Step A: Biomass fuel input per hour

VRG-AS-8 states the biomass input is 6,175 kWh/hr.

Convert to MMBtu/hr using the standard conversion of 3,412.14 Btu per kWh:

6,175 kWh/hr × 3,412.14 Btu/kWh ÷ 1,000,000 = **21.07 MMBtu/hr**

Step B: Annual fuel consumption

Assuming 8,000 operating hours per year (conservative; permit allows 8,760):

21.07 MMBtu/hr × 8,000 hrs/yr = **168,560 MMBtu/yr**

Step C: Gross CO_2 from biomass combustion

The EPA mandatory GHG reporting rule (40 C.F.R. Part 98, Subpart C, Table C-1) assigns woody biomass a CO_2 emission factor of **206.7 lb CO_2 per MMBtu**. This is the same factor used in the EPA CHP Calculator v3.5 (named range "co2wood" in the Factors sheet). It is comparable to coal (207.1 lb/MMBtu) and 77% higher than natural gas (116.9 lb/MMBtu).

168,560 MMBtu/yr × 206.7 lb CO_2/MMBtu ÷ 2,000 lb/ton = **17,421 tons CO_2/yr**

Step D: Displaced grid electricity CO_2 credit

VRG generates 2,200 kWe × 8,000 hrs ÷ 1,000 = **17,600 MWh/yr**

Vermont is within ISO-NE, which corresponds to the AVERT New England region in EPA's CHP Calculator. The AVERT New England 2022 CO_2 factor is approximately **547 lb CO_2/MWh** — roughly 70% of the national average, reflecting New England's relatively clean grid.

17,600 MWh/yr × 547 lb CO_2/MWh ÷ 2,000 = **4,814 tons CO_2/yr displaced**

Step E: Net CO_2 position

VRG uses all recovered heat internally — no boiler fuel is displaced externally.

Displaced boiler CO_2 = **0 tons/yr**

Net CO_2 = Gross biomass CO_2 − Displaced grid CO_2 − Displaced boiler CO_2

17,421 − 4,814 − 0 = **+12,607 tons CO_2/yr net emitter**

Step F: Act 179 comparison — the 133% calculation

Act 179 requires VRG to demonstrate at least a **50% net lifecycle GHG reduction** compared to a new combined-cycle natural gas turbine (CCGT) producing the same electricity output.

A new CCGT producing 17,600 MWh/yr at approximately 850 lb CO_2/MWh would emit:

17,600 MWh/yr × 850 lb CO_2/MWh ÷ 2,000 = **7,480 tons CO_2/yr**

VRG's gross stack emissions are **17,421 tons CO_2/yr**.

The percentage by which VRG's gross emissions exceed the CCGT baseline:

(17,421 − 7,480) ÷ 7,480 = 9,941 ÷ 7,480 = **+133%**

Conclusion: VRG emits 133% more CO_2 than a new CCGT would emit producing the same electricity. Act 179 requires a 50% reduction. The gap between what VRG does and what Act 179 requires is therefore 183 percentage points in the wrong direction — on a gross stack basis, before any life-cycle accounting.

The Commission must require VRG to produce its own GHG life-cycle analysis, one that accounts for stack emissions, SCR additions, logging and feedstock transportation, pyrolysis process emissions, and flaring. The time frame for this life-cycle analysis must conform to Vermont's 2030 and 2050 greenhouse gas reduction goals. This analysis must use an emissions factor of 206.7 lb CO_2 per MMBtu in accordance with 40 C.F.R. Part 98, Subpart C, Table C-1. It must not assume "carbon neutrality."

The "Highest Efficiency" Standard

Even if the 62.38% figure were accepted as methodologically sound, it does not necessarily satisfy 30 V.S.A. §248(b)(11)(B). That statute requires the facility to achieve the highest design system efficiency that is commercially available, feasible, and cost-effective — not merely to clear a threshold. It is a maximization standard.

Published engineering literature on biomass pyrolysis and gasification CHP systems at comparable scales consistently shows that total system efficiencies of 68% or more are achievable when recovered heat is delivered to external beneficial uses — district heating, nearby industrial processes, or greenhouse operations. VRG's heat is used entirely internally. The record does not reflect that VRG considered, evaluated, and rejected external heat delivery designs on the grounds of commercial unavailability, infeasibility, or cost-effectiveness.

Without that analysis, the Commission cannot make the affirmative finding §248(b)(11)(B) requires. The Marshall certification letter addresses whether VRG clears 60%. It does not address whether 62.38% is the highest efficiency VRG could achieve.

The public and the Commission, which represents the public, need to see:

- The underlying CETY documentation so that the assumptions behind the 62.38% figure can be evaluated;
- Detailed methodology for the 1,512 kWh thermal credit, including the allocation of waste heat between biomass drying and ORC input, with confirmation that no energy stream is credited in more than one output category;
- The efficiency calculation on a net basis after deducting all parasitic enegy loads;
- Analysis, demonstrating that the current design achieves the highest commercially available, feasible, and cost-effective efficiency under 30 V.S.A. §248(b)(11)(B), or explain in detail why higher-efficiency alternatives — including external heat delivery — were not selected;
- Detailed licensing information and emissions analysis for all six facilities VRG claims CETY runs in Europe; and
- A transparent life-cycle analysis using Vermont 2030 and 2050 time frames and EPA emissions factors

Thanks for acknowledging these, and my other comments.

/s/ Pike Porter

member of the public tired of accounting trickery

Burlington, Vermont

References

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Engineering Services of Vermont, LLC (Jerry L. Marshall, P.E.), Efficiency Certification Letter, Exhibit VRG-AS-8, August 14, 2024.

Vermont Renewable Gas, LLC, Evidentiary Hearing Transcript, PUC Case No. 24-2797-PET (testimony of Evan Dell'Olio and Alexander Skorokhodov).

Vermont Act 179 of 2024, An Act Relating to the Renewable Energy Standard (requiring 60% efficiency AND 50% net lifecycle GHG reduction for new woody biomass facilities, codified at 30 V.S.A. §8004 et seq.).

30 V.S.A. §248(b)(11)(B) (requiring highest commercially available design system efficiency for in-state woody biomass generation facilities).

CETY (Clean Earth Capital), VRG Project Technical Documentation, September 29, 2023 (referenced in VRG-AS-8 but not filed in the public record).

Environmental Protection Agency CHP Resources. https://www.epa.gov/chp.

https://www.epa.gov/chp/chp-energy-and-emissions-savings-calculator.