STATE OF VERMONT
PUBLIC UTILITIES COMMISSION

Case No. 24-3359-INV

Investigation of the standard-offer contract Between Vermont Renewable Gas, LLC and the Standard Offer Facilitator	))))

SUPPLEMENTAL PREFILED TESTIMONY OF
ALEXANDER SKOROKHODOV
ON BEHALF OF

VERMONT RENEWABLE GAS, LLC

Summary of Testimony

Mr. Skorokhodov's testimony addresses conclusions presented by the Proposal Decision Addressing Standard-Offer Contract Eligibility.

Q1: Please state your name and position relative to this matter.

A1: My name is Alexander Skorokhodov. I am Director of Technology and Engineering for Clean Energy Technologies, Inc. (CETY), a NASDAQ publicly traded company on the New York Stock Exchange. CETY's wholly owned subsidiary CETY Capital, LLC is a minority owner in Vermont Renewable Gas, LLC ("VRG"), a Vermont limited liability company with its principal place of business at 145 Pine Haven Shores #1000A Shelburne, Vermont 05482. CETY is also serving as project Engineering, Procurement, and Construction (EPC) contractor for the biogas production facility and related 2.2 MW electric generation facility to be known as Vermont Renewable Gas – Lyndon in Lyndon Vermont proposed in Case No. 24-2797-PET ("the Project"). Additional information about my CETY and my background can be found in the prefiled testimony I filed in this matter on December 12, 2024.

Q2: What is the purpose of this Testimony?

A2: My testimony seeks to provide detailed, expert responses concerning conclusions presented by the Proposal for Decision Addressing Standard-Offer Contract Eligibility ("Proposal for Decision"), and offers technical solutions to the issues posed by the Hearing Officer.

Q3: Please explain the present system design for the VRG facility.

A3: The system was designed as a thermochemical pyrolysis unit to maximize volatile recovery (including methane) from lignocellulosic biomass while co-producing a stable, high-carbon biochar. The gas composition – approximately 27% methane –is a function of the temperature, residence time, and anaerobic environment during the thermal breakdown of lignocellulosic feedstock. Unlike anaerobic digestion which typically produces fuel gas with a balance of nearly equal parts methane and carbon dioxide, basic thermochemical decomposition generates a broader spectrum of combustible gases (CO, CH4, H2, and light hydrocarbons), contributing to a more energy-dense but compositionally mixed fuel gas stream.

The design of the proposed system was optimized for stability, energy efficiency, and climate benefits. It intentionally prioritized the production of a reliable thermal energy stream and high-carbon biochar, which together create superior carbon avoidance and carbon removal outcomes. Methane concentration, while important to meet the obligations of the Agricultural Methane Standard Offer was not the only design criterion, especially when no guidance was provided by either VEPP, Inc. or any publicly available materials from the State of Vermont prior to VRG's application for a Standard Offer contract or during the application process as to what an acceptable percentage of methane must be. Methane volume in relation to other gases was one consideration in relation to a suite of system-wide performance goals.

Furthermore, we note that methane proportion still represents a higher volume of methane per ton of feedstock than what is typically recovered through anaerobic digestion of wet agricultural wastes (190% more effective), due to the high volatile matter content and dry nature of our conditioned woody biomass feedstock (See Ex.VRG-INV-AS-4-Comparison_of_Conversion_Efficiencies).

Q4: Why did CETY not originally design the system to increase the methane content of the gas through its design of the thermochemical decomposition process and gas refining processes?

A4: CETY did not originally include methane-enhancing processes for two key reasons: (1) technical fit and (2) economic and policy alignment.

Technically the primary design goal of the project was to thermochemically convert low grade lignocellulosic biomass into recoverable energy and high-carbon biochar while assuring consistent recovery of methane in the gas stream. The system was optimized for high throughput, durability, and operational simplicity – including using direct combustion of the gas for heat and power rather than introducing complexity through catalytic reforming systems. While catalytic conversion and steam reforming are proven technologies to produce a gas stream with higher methane content, they require precise gas conditioning, a catalyst (often nickel-based), and tighter process controls, all of which

introduce capital and operational cost burdens. I explained this technical capability available to the Commission in my previous testimony (See Skorokohdov Prefiled 12.12.24 at 11). CETY's ability to deliver up to Renewable Natural Gas, a pure methane product was also made available to the Standard Offer Facilitator during VRG's application process for a Standard Offer Contract and an explanation for why such an upgrade was not being pursued as part of the VRG – Lyndon project scope was provided. (See Ex. VRG-INV-ED-2-Synergy_Bioprodcts_Mail_VEPP_Email_2).

From a policy perspective, VRG relied on long-standing guidance from the Public Utility Commission that the Standard Offer Program was not technology-specific, and that eligibility should be based on feedstock origin and an ability to recover methane from such appropriate feedstock for use in an electric generator. There was no indication that a specific methane percentage threshold would be required until the time of the Proposal Decision Addressing Standard-Offer Contract Eligibility. In fact, as noted above, VRG's system achieves higher methane recovery per ton of biomass than a conventional anaerobic digester treating livestock manure, which was submitted to the Commission as part of my previous testimony, and VRG presented this fact as evidence in support of treating its proposed facility as a "farm methane" plant. See Ex.VRG-INV-AS-4-Comparison_of_Conversion_Efficiencies).

In sum, the project's design reflects an effort to meet Vermont's energy, climate, and rural development goals using a system that is cost-effective for achieving those goals. However, if the Commission requires that the VRG system include a higher constituency of methane (greater than 50%) for electricity generation, VRG is willing to introduce catalytic steam reforming to the process to meet the new expectations set forth by the Hearing Officer – not because it improves climate or economic outcomes, but to demonstrate good faith and regulatory flexibility to whatever standard the Commission now believes is appropriate.

Q5: Why is it technically feasible now to adjust the methane composition to exceed 50%, and how will that be done?

A5: As noted above, VRG made known to the Commission's Facilitator nearly two years ago that there was technical ability to provide a purer methane product at the facility. If the Commission adopts the proposed standard for methane in the Proposal for Decision, VRG has determined that it is technically feasible to increase the methane content of the recovered gas stream to exceed 50% through combination of steam injection and a catalytic upgrading, specifically using a nickel-based or comparable catalyst within the reforming zone of the pyrolysis gas pathway. This process commonly referred to as steam methane reforming (SMR) or catalytic steam reforming, works by injecting steam (H2O) into the hot gas stream under controlled conditions. The steam reacts with carbon monoxide and lighter hydrocarbons driven off of the lignocellulosic biomass to generate

additional methane (CH4) through water-gas shift and methanation reactions, particularly in the presence of a suitable catalyst. The reactions are well-characterized and this technology is commercially available.

If required, the engineering team estimates that with this modification, the methane content of the gas stream can be increased to at least 51%, sufficient to meet the Hearing Officer's proposed "majority" constituency threshold.

Importantly, this adjustment does not compromise the overall climate benefits of the project. In fact, by increasing the methane proportion and enabling higher-efficiency energy recovery through combustion in a low NOx engine, the project will likely improve its thermal efficiency and emissions performance. This makes the adjustment not only technically viable but consistent with the broader goals of Vermont's energy and environmental policy.

Q6: Does this conclude your testimony?

A6: Yes.

Alexander Skorokhodov

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DECLARATION OF ALEXANDER SKOROKHODOV

I declare that the testimony and exhibits that I have sponsored are true and accurate to the best of my knowledge and belief and were prepared by me or under my direct supervision. I understand that if the above statement is false, I may be subject to sanctions by the Commission pursuant to 30 V.S.A. § 30.

Dated at Tel Aviv, Israel this 19th day of June, 2025.

Alexander Skorokhodov