BEFORE THE PUBLIC SERVICE COMMISSION
OF THE STATE OF MISSOURI

In the Matter of the Establishment of a Working Case for the Review and Consideration of Promulgating a Rule Consistent with Section 386.895.	))))	File No. GW-2022-0060

RAES RESPONSE TO ORDER REQUESTING COMMENTS

COMES NOW Roeslein Alternative Energy Services, LLC ("RAES" or "Company"), and for its response to the *Order Requesting Comments*, respectfully states to the Missouri Public Service Commission ("Commission") as follows:

1. On August 2, 2023, the Commission issued its *Order Requesting Comments*, wherein it invited comments to certain questions contained in Attachment A to the Order and directed that "Comments from the public and interested stakeholders in answer to the questions in Attachment A shall be filed no later than September 18, 2023.

2. Attached hereto as **RAES Attachment A** is a document containing RAES' comments for consideration by the Commission.

Respectfully submitted,

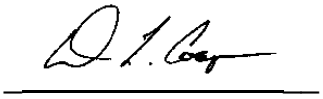
//S// Tim Johnston
Tim Johnston, P.E.
Vice President
Roeslein Alternative Energy
tjohnston@roesleinae.com
(303) 475-1374

CERTIFICATE OF SERVICE

The undersigned certifies that a true and correct copy of the foregoing document was sent by electronic mail to the following counsel this 18th day of September, 2023:

Office of the General Counsel
staffcounselservice@psc.mo.gov

Office of the Public Counsel
opcservice@opc.mo.gov



RAES ATTACHMENT A

Renewable Natural Gas Program

1. **Should the Commission adopt separate rules regarding renewable natural gas (RNG) for biogas, hydrogen, and gas derived from waste CO2? Please explain your reasoning.**

RAES RESPONSE: Yes. The Commission should adopt different rules for hydrogen to account for differences in flammability limits, diffusion through certain piping materials, and interchangeability with traditional fossil natural gas.
However, recovery of investments in facilities and for operating costs should be consistent across these sub-sectors.

2. **Are there, or should there be, separate classifications of RNG facilities based upon feed stock (i.e. agricultural applications, landfill collection, etc.)? If so, how should those be defined?**

RAES RESPONSE: Yes. There should be separate gas quality classifications of RNG facilities based on feedstock. This is, in part, because:

- Agricultural feedstocks used in anaerobic digesters produce biogas which can be refined to renewable natural gas that will not include components of concern such as cyclical hydrocarbons, siloxanes, etc., or even hydrocarbons heavier than methane.
- Landfill gas does have documented risk of inclusion of cyclical hydrocarbons, heavy metals and siloxanes and the gas quality specification for this gas should reflect this risk.
- Food waste digesters and municipal waste digesters may potentially produce gas with some siloxanes. The gas from these sources should be tested initially upon commissioning and annually thereafter.

3. **Subsection 386.895.2, RSMo, states, in part: The commission shall adopt rules for gas corporations to offer a voluntary renewable natural gas program.**

   a. Does this statute authorize, but not require, a program applicable to customers who volunteer to participate?

RAES RESPONSE: N/A

   b. Does this statute authorize, but not require, that utilities offer a program to generally inject biogas into the gas supply, the costs of which are borne by all customers of that utility whether or not a given customer volunteers to participate?

RAES RESPONSE: Yes.

4. Subsection 386.895.5, RSMo, allows recovery of prudent, just, and reasonable qualified investment costs.

a. What factors should the Commission consider in determining prudence?

RAES RESPONSE: The Commission should consider factors similar to those considered in regard to the public interest question in applications for renewable electric facilities. An example of this is found in the Report and Order (p. 42) in *In the Matter of the Application of The Empire District Electric Company for a Certificates of Convenience and Necessity Related to Wind Generation Facilities*, File No. EA-2019-0010 (June 19, 2019):

> The Commission finds that the Wind Projects will promote the public interest. In addition to the low cost generation that the Wind Projects will provide, these projects meet the policy goals, as identified by the Commission in the Grain Belt Express Clean Line LLC case, to diversify energy resources and develop "economical renewable energy sources". Additionally, the Wind Projects are also important to satisfy the public interest in regard to the use of renewables, especially through the sale of RECs to non-residential customers as set out as a condition in the Non-Unanimous Stipulation and Agreement and adopted in this order as a condition of the certificates. Finally, the evidence showed that the Wind Projects will promote the public interest through the local and state economic benefits such as additional property taxes, land lease payments, and job creation.

(footnotes omitted).

b. How will prudence be demonstrated prior to recovery?

RAES RESPONSE: Again, the Commission should craft a process for demonstrating prudence in accordance with the process used for renewable electric resources and the infrastructure necessary to access those resources.

c. Should prudence be determined in the rate adjustment mechanism (RAM) case, rate case, or some other or combination of cases?

RAES RESPONSE: It may be addressed in a combination of cases. Depending on circumstances and the decision being examined, this could arise in a certificate of convenience and necessity case, rate case or the RAM case.

d. How will prudence be determined for a voluntary program that is likely more costly than the traditional alternative and without a state or federal supply mandate?

RAES RESPONSE: See the response in 4.a. above.

e. What factors should the Commission consider in determining the justness?

RAES RESPONSE: The Commission should use similar factors to those considered in determining the justness of purchases of renewable electricity.

f. Should justness be determined prior to recovery?

RAES RESPONSE: Yes.

g. Should justness be determined in the RAM case, rate case, or some other or combination of cases?

RAES RESPONSE: Prior to recovery, which may be in in the RAM case and/or a rate case.

5. What should be included as the minimum filing requirements for a RNG application?

RAES RESPONSE: The Company will leave this to others.

a. Should all applications include a demonstration that each *Tartan* criteria has been met?

RAES RESPONSE: Yes, to the extent an application includes a request for certificate of convenience and necessity.

6. In the workshop discussion, it was noted that some biogas facilities would generate the most biogas in summer months. However, much of the energy consumption would occur in winter months, especially for residential customers. How would a hypothetical RNG program match fuel consumption with actual fuel production?

RAES RESPONSE: In the PGA process, the Commission already encourages that a percentage of the annual volumes be either purchased and placed into storage or be secured by a firm contract to provide gas during the heating season. The Commission further encourages investor-owned gas utilities to complete these actions on a schedule that requires that any physical gas purchases placed into storage occur during the summer months when RNG is produced from seasonal producers such as swine operations.

Much of the physical gas produced by RAE from its Missouri operations is ultimately sold to the municipal utilities in NW MO, to be placed into storage on the TCE/ANR pipeline system, to provide resources for subsequent use. This is less of an issue for most other RNG providers, which produce gas at an even rate throughout the year.

7. **What credits or certificates should be used to track volumes of RNG generated?**

    a. **Are there current certification/crediting processes already in use, or should a certification specific to Missouri be developed? Please provide as much detailed information as possible regarding the certification/crediting process currently in use.**

RAES RESPONSE: RAE would encourage the MPSC not to develop its own tracking system.

Most RNG currently produced is tracked by the EPA for generation of credits under the Renewable Fuel Standards (RFS) program. These credits are referred to as RINs, short for the Renewable Identification Number associated with these credits. Some RNG is also tracked under the Low Carbon Fuel Standard (LCFS) programs operated by the states of California and Oregon. These programs (RFS and LCFS) can generate renewable credits from the same renewable natural gas.

A number of other programs connect voluntary purchasers of renewable natural gas or credits generated from that gas with RNG producers. These programs all have stringent requirements for tracking feedstocks and the gas produced. RAE participates in one of these programs, the International Sustainability and Carbon Certification program. The ISCC certifies the RNG provider and tracks the RNG production from feedstock to injection into a pipeline.

All these programs (RFS, LCFS, ISCC) also require at least annual inspection of the RNG production facilities. ISCC requires 2 inspections per year.

    b. **Please describe the current or proposed certification process, how ownership of credits is derived, and existing markets for RNG credits.**

RAES RESPONSE: The RFS program, which is the most universal of the three programs listed above, generates credits for the RNG producer at the point where the RNG is injected into a pipeline connected to the national pipeline grid and not owned by an entity affiliated with the RNG producer. Those credits are owned by the owner of the RNG at that point of injection. This may not always be the RNG producer; several companies have come into existence to assist RNG producers with the extensive documentation requirements of the various programs for a percentage of the value of the credits generated. The RFS program generates credits tied to the amount of diesel fuel equivalent to the energy content of the RNG produced.

    c. Do RNG credits expire? If so, please provide citations to regulations of the various credits including timeline from development of a credit to expiration.

RAES RESPONSE: There is no expiration date for California's Low Carbon Fuel Standards (LCFS) credits. You can hold/bank the credits for any period of time. Unlike California's LCFS program, EPA RFS RINs expire. Unused RINs can carry over via the additional extended compliance year allowance, but beyond that, if not used, they expire. Since RINs always expire at the end of a calendar year, all expired RINs will be reported (epa.gov)

d. Which entities will be credited with the renewable attributes (i.e. credits) of RNG within an Investor Owned Utility RNG program? Will those renewable attributes be transferrable?

RAES RESPONSE: Renewable attributes are transferrable. As noted above, the entity owning the RNG at the point of injection into a pipeline that is part of the national pipeline grid (a transmission pipeline or a distribution system) will be credited with the renewable attributes. The issue noted in the answer to (b) above would probably not apply to a regulated utility that owned the RNG at the point of injection. The point of that restriction is to have a third party responsible for measuring the amount of RNG injected and a regulated utility is under regulations governing measurement accuracy.

e. What entity will be responsible for running and tracking the RNG credit system?

RAES RESPONSE: EPA currently runs and tracks the RFS program for RNG credits. California and Oregon currently run and track their LCFS program. ISCC currently runs and tracks credits under that program. I believe the MPSC should not duplicate these systems, but instead should review and approve these programs for use by Missouri entities.

f. How should sales/transfers of RNG credits be handled?

RAES RESPONSE: Sales/transfers of the various RNG credits should be handled under the regulations of those various programs.

i. What mechanism is appropriate to return those revenues to ratepayers or participants?

RAES RESPONSE: Ultimately, the mechanism should be project/applicant specific to allow the Commission flexibility to address the proposal.

To the extent that all or a portion of the revenues generated by the credits are realized by the regulated utility, this revenue should first be applied to cover the regulated operating costs of the utility and recovery of the investment related to generation of the credits and injection into the utility pipeline system. Excess revenue could accrue to the PGA account or be treated in some other fashion.

A second revenue stream is also produced from the sale of the gas after the renewable credits are generated and separated from the gas volumes. These volumes are ordinarily sold at the daily midpoint price of the pipeline hub for that part of the pipeline or distribution system. This revenue stream could be treated using the same methodology as the credit revenue, although the utility PGA program may be the purchaser of that gas and the source of this revenue.

g. Should RNG credits expire? If so, when?

RAES RESPONSE: RNG credits should not expire.

8. Please provide detailed explanations of the economics of current RNG facilities.

a. What are the primary revenue streams that support these facilities?

i. Please provide detailed estimates, with citations to the extent possible, of the market value of various products.

RAES RESPONSE: For a typical RNG project that qualifies for the CA or OR LCFS programs, the three revenue streams are from LCFS credits, RFS credits (RINs) and the sale of the "brown gas" remaining after the credits are generated and separated from the RNG molecules.

The LCFS and RFS programs have market-driven values. The LCFS value is based on the value of the RNG credits to a natural gas fueling station end user in California or Oregon, who purchase the credits to be able to market their fuel as renewable. The LCFS programs in those states are funded by carbon taxes levied against the sale of non-renewable vehicle fuel. The current LCFS credit price is about $65/dth, but credit generation is also based on the "Carbon Intensity" score of the RNG-producing facility.

RNG facilities that reduce methane and carbon dioxide emissions from existing facilities get better scores and generate a higher percentage of a full credit for each MMBTU of RNG produced. For example, a dairy that is capturing The RFS credits are priced based on a similar program but related to the replacement value of an equivalent amount of diesel.

b. What equipment is necessary to construct a RNG facility by fuel source type?

RAES RESPONSE: RAE only constructs RNG facilities that utilize agricultural feedstocks, specifically swine manure or cow manure. Our basic process is to take the feedstock into a digester, either of the lagoon type or the Constant-Stirred Tank Reactor (CSTR) type. In the digester, archaea bacteria from the manure breaks down the manure, creating biogas, which is a mixture generally consisting of 60 – 65% methane and 35 – 40% CO2, as well as levels of H2S in the 1000 ppm range. This biogas is then collected

through a pipeline network to a gas upgrade system where the H2S and most of the CO2 is removed, producing RNG, which has a composition of 98% or greater methane, less than 2% CO2, and H2S levels under 4 ppm. This RNG is pipeline quality gas with a BTU content of between 960 and 1010 per standard cubic foot and a WOBBE number of about 1330, in the middle of the typical range (1310 – 1390) for fossil natural gas. This allows the RNG to mix well with the fossil gas that makes up the vast majority of the natural gas delivered by regulated utilities.

Most American RNG facilities use one of three technologies to upgrade the biogas:

1) Membrane technology – several manufacturers sell polymer membrane systems for separation of the CO2 from the methane. The membranes are hair-fine tubes with pores that are sized to allow CO2 molecules to pass through the walls of the tubes but present methane molecules from passing. Biogas is introduced to the interior of the tubes at 140 – 180 psig and the space outside of the membranes is maintained at a low pressure to drive the filtering of the CO2. Stacking two stages of such membranes allows recovery of 97% of the methane; three stages raises this to 99% recovery.

2) Pressure-swing adsorption (PSA) – several manufacturers sell systems that use separation media that looks like small beads. Similar to the membranes, the beads have pores sized to allow a CO2 molecule to be pulled into the surface of the media by capillary action when biogas is introduced into the media tanks at about 100 psig. As gas flows from the bottom of the tank towards the top through the media, all CO2 is removed. The media eventually fills up with CO2, at which time the biogas is switched to another tank. Most systems have 4 media tanks. The CO2 is removed by pulling a vacuum on the media, so flow progresses from one tank to another wit the other tanks in various stages of the depressurization, regenerations and repressurization process.

3) Amine adsorption – this is a mature technology that has been used in the fossil gas sector to remove H2S and CO2. The biogas flows up through a contactor tower while an amine solution runs down through the tower. The amine adsorbs the CO2 and H2S and is then sent to a still to be heated and regenerated before being sent back to the contactor tower.

Membranes and PSA technology are used for systems up to about 2000 scfm, and Amine is used almost exclusively for large systems over 3000 scfm. All three technologies compete in the 2000 – 3000 scfm range. Membranes have the lowest capex but the highest operating costs due to the compression required to maintain the pressure drops. PSAs have somewhat higher capex but slightly lower operating costs. Amine systems have much higher capex but much lower operating costs.

From the point of production of the RNG, the remining equipment to move the RNG to an interconnect is the same as would be used for any other unodorized gas.

c. What are the ongoing costs of processing RNG to natural gas (NG) pipeline quality by fuel type?

i. Are there incremental investments/replacements necessary over the life of the facility? Please provide detailed explanations, timelines, and cost estimates for those investments.

RAES RESPONSE: Operating costs for agricultural feedstock RNG facilities, not including recovery of the investment, range from $10 to $20 per Dth.

d. What are the approximate costs for constructing a RNG facility by fuel source type?

RAES RESPONSE: Initial capital expenditure for agricultural feedstock RNG facilities, including the digesters, low pressure biogas pipelines, gas upgrading system and high pressure pipeline and interconnect generally run $200 - $400 per Dth of RNG.

e. Is RNG typically stored on-site, and if so, what is a typical storage amount based upon peak monthly production?

RAES RESPONSE: RNG is not usually stored on site. For swine and dairy feedstock systems using lagoon digesters, a certain amount of biogas can be stored in the lagoons, but this amount is on the order of a week, not long-term storage.

f. Provide estimates for the cost of pipeline or distribution system interconnection based upon various distances from RNG facilities.

RAES RESPONSE: Pipeline costs are the same as other distribution or transmission pipelines. Interconnect costs can vary. Generally, distribution interconnects are less expensive due to the lower delivery pressures. All interconnects require a gas quality assurance system, which costs on the order of $300,000 to $500,000, plus compressors to raise the RNG pressure up to pipeline pressure, plus gas measurement, overpressure protection, and in some cases, odorization. Transmission pipeline interconnects can range as high as $3.5 million.

g. Provide detailed explanations for RNG production quantities by feed stock type.

i. How does production from RNG facilities change based on variations from normal weather (i.e. colder than normal, warmer than normal, various precipitation levels, etc.)? Do those changes vary by feed stock?

RAES RESPONSE: RNG production varies based on the temperature in the digester. To the extent that this temperature can be stabilized in the range of 100F, weather variations are not a factor. For most swine and some dairy projects, the lagoon digesters are not

heated, resulting in the production of biogas swinging from a high in June and July to no production in the winter. The archaea bacteria that produce the biogas become dormant below 60F.

ii. What is the typical variation for gas production (upper bound, lower bound, and confidence intervals if available)?

RAES RESPONSE: If feedstock availability is not a factor, RNG systems with heated diesters should not vary more than 20%, even seasonably. See the answer in (i) for unheated digesters.

iii. How do various agricultural feed stocks impact RNG production (i.e. poultry, cattle, swine, vegetative, combination, etc.)?

RAES RESPONSE: Each agricultural feedstock has typical production levels per animal or per dry ton of vegetable material. For cattle, manure production and therefore RNG production varies between beef cattle, dairy cattle, heifers, and even dry milk cows. The number of animals and the type are the primary factors to be considered in evaluating a project.

h. What safety/security measures need to be installed at RNG facilities and what are the approximate costs for each measure based on facility size?

RAES RESPONSE: All digesters need overpressure protection, although the operating pressures are in the range of 0 – 2 inches of water column. CSTR digesters also need to have spill containment.

Gas upgrade systems need to have the typical safety devices utilized for gas compressors and pressure vessels: high pressure shutdown switches and overpressure protection devices. Most upgrade systems are also insulated, but this is usually to stabilize the operating temperatures and not for safety.

Costs for these safety measures are built into all of RAE's projects and are not broken out separately, since we would not try to operate without these safety measures.

i. Should a RAM include any tax incentives? Why or why not?

RAES RESPONSE: N/A

9. Pipeline quality limits - questions for operators of natural gas transmission and distribution systems:

a. Heating Value

i. What is the range of heating values of the natural gas your system currently receives? Please provide numerical values and specify the units (e.g. 950 to 1,200 BTU/dry standard cubic foot, at STP).

ii. In your opinion, what is an acceptable range of heating values if

renewable natural gas is substituted for or blended with the natural gas delivered to your system? (If different from the range for the natural gas your system currently receives, please explain the reason(s) for the differences.)

b. Water Vapor

i. What is the maximum limit for water vapor in the natural gas currently delivered to your system? Please provide a numerical value and specify the units (e.g. 7 pounds of water vapor per MMcf).

ii. In your opinion, what is a reasonable maximum limit for water vapor content if renewable natural gas is substituted for or blended with the natural gas delivered to your system? (If different from the limit for the natural gas your system currently receives, please explain the reason(s) for the differences.)

c. Impurities

i. What are the maximum limits for the following listed impurities in the gas currently delivered to your system? Please provide a numerical value and specify the units (e.g. 1.0 grain of hydrogen sulfide per 100 cf).

1. Hydrogen sulfide
2. Total Sulfur
3. Oxygen
4. Liquid hydrocarbons
5. Carbon dioxide
6. Hydrogen
7. Active bacteria or bacterial agents
8. Hazardous or toxic substances
9. Other

ii. In your opinion, what are reasonable maximum limits for impurities if renewable natural gas is substituted for or blended with the natural gas delivered to your system? (If different from the limits for impurities in the natural gas your system currently receives, please explain the reason(s) for the differences.)

1. Hydrogen sulfide
2. Total Sulfur
3. Oxygen
4. Liquid hydrocarbons
5. Carbon dioxide
6. Hydrogen
7. Active bacteria or bacterial agents
8. Hazardous or toxic substances
9. Other

d. Do you have any additional suggestions related to gas quality limits if renewable natural gas is substituted for or blended with the natural gas delivered to your system?

RAES RESPONSE: RAE offers the following comment regarding gas quality and interchangeability:

> Since 2019, RAE has provided RNG delivered into three interconnects on the TCE/ANR pipeline laterals that feed the Albany, Mercer, Princeton, Unionville, Green City and Milan municipal natural gas systems. Since these RNG systems are unheated lagoon digesters of swine manure, the RNG production seasonal variation causes all these towns, as a practical matter, to have 100% RNG in their systems from June through September, 100% fossil gas from December through March, and gas with varying levels of RNG during the shoulder months. During those shoulder months, daily swings in the RNG fraction occur as a result of a relatively steady daily production of RNG that becomes part of a highly variable hourly usage caused by the high percentage of gas in these communities used by residential customers. Since beginning production, we do not know of any issues related to gas quality or interchangeability.

10. **Pipeline quality measurement questions for operators of natural gas transmission and distribution systems:**
    a. **What are your current capabilities for monitoring gas quality of the natural gas transported in your pipeline system?**
    b. **If renewable natural gas is substituted for or blended with the natural gas delivered to your system, which entities(s) should be responsible for monitoring gas quality:**
        i. The entity delivering the renewable natural gas to your system?
        ii. The operator of the natural gas system?
        iii. Other?

RAES RESPONSE: N/A

11. **What differences exist between interconnection at the LDC level versus interstate pipeline level?**

RAES RESPONSE: N/A

12. **Do you have any further comments regarding specific topics that should be considered in the context of a RNG rule? Please provide as much information as possible and citations for supportive information, if available.**

RAES RESPONSE: N/A

<u>Hydrogen</u>

1. **Is your company or city currently considering projects that would include the use of hydrogen as a fuel?**
    a. **If "yes", what type(s) of projects are being considered?**

b. **If "yes", is your city or company considering using a hydrogen blended with natural gas, 100% hydrogen, or other?**
c. **If "yes", are you considering transporting hydrogen in existing natural gas pipelines?**
d. **If "yes", are you considering building a dedicated pipeline network for purposes of transporting the hydrogen or hydrogen/natural gas blend?**
e. **If "no", is the use of hydrogen as a fuel something that your company or city may consider using as a fuel in the future?**

RAES RESPONSE: Not applicable to RAE.

PGA Recovery

1. **Is a LDC's purchased gas adjustment (PGA) mechanism impacted by the RNG statute/rule? Why or why not?**
2. **What are the issues related to PGA sales versus transportation customers (buying their own gas) with regard to RNG injections to the distribution system?**

RAES RESPONSE: Not applicable to RAE.