Staff Data Requests

I. Wooster Renewable Energy, LLC, Case No. 14-2253-EL-REN

1. For Section A, please confirm the case number in this application as 14-2253-EL-REN.
   Yes

2. For Section A, please confirm that this application for captured heat energy is associated with the renewable electric generating facility certified in case no. 14-0824-EL-REN.
   Yes

3. For Section G, please indicate which of these specific sources of thermal energy are included in this application: heat captured from a generator of electricity, boiler or heat exchanger fueled by biologically derived methane gas. All three are included.

4. For Section G, is any of the thermal energy created by the system vented, and if so, (a) where does that venting occur on the process flow diagram, and (b) is the applicant proposing to exclude any vented thermal energy from its quantification of a renewable resource?
   (a) Venting or release of heat from the system through a radiator is not a regular activity on this site.
   (b) If venting occurs is excluded from quantification of a renewable resource.

5. For Section G, the application indicates that excess heat is used for process and comfort heating. Typically, what percentage of the excess heat is used for process and what percentage is used for comfort heating?
   5% comfort heating and 95% process. In warmer months when comfort heating is not required then 100% of excess heat goes to the process.

6. With regard to Section G.2 of the application submitted, please indicate the type, manufacturer and nameplate capacity of the generator unit used at the facility. The CHPU (combined heat and power unit) installed is a 1 MW CAT engine.

7. For Section G.2 of the application, please identify the fuel types used by the facility.
   Biologically derived methane gas.

8. For Section G.2 of the application, please describe the content (fully characterize the fuel material) and source of all specific fuel feedstocks.
   Per the OEPA approved Sludge Management Plan, biosolids (sewage sludge), manure, foodwastes, FOG (fats, oil, & grease), energy crops, i.e., corn silage, and other organic feedstocks

9. In Section G.2, for purposes of renewable energy credit (REC) creation, is the applicant proposing to quantify thermal energy captured or thermal energy reused?
   This is for thermal heat reused.

10. Section G.2 of the application refers to the creation of carbon offsets. Describe how the facility is creating carbon offsets, how those offsets are managed, and how the carbon offsets relate to any RECs that would be sought for this facility's output.

The use of the term carbon offsets in application is confusing and should not have been used. At this facility RECs for electricity through the PUCO is the only other credit or off-set in place currently. We are applying to add RECs for thermal with PUCO.

11. For Section G.2, the applicant indicated a nameplate capacity of 1 MW. Has the facility obtained an EIA 860 Plant Name and Code? If yes, please provide. If not, explain why such is not required.

Not yet applied for.

12. Regarding Section G.3 of the application, please provide a detailed description of how heat captured by each source is going to be measured and verified, including the configuration of the meter(s), the meter types(s), and meter accuracy. What is the projected in-service date of the thermal meters? Please provide documentation.

Thermal REC: Engine is cooled using a heat loop which circulates Glycol-Water mixture (50%) across the plant. The flow of the glycol is ***175 GPM*** (Pump rating, see fig.).

$$Glycol\ recirculation\ rate: 175 \frac{Gal}{min} * 8.34\ lbs/gal$$

$Glycol\ recirculation\ rate$: 1,460 lbs/min

We have temperature sensor located in the engine which show the temperature of glycol taking waste heat from the engine. **The temperature is typically around 190^0 F** *(See fig. 1)* This glycol flows in the plant supplying heat for plant purpose (Digester heating, Floor heating, Pasteurization). **The return temperature of glycol is around 163^0 F** *(See fig. 1)*

$$Heat\ utilized\ in\ the\ plant\ \frac{BTU}{min} = 1{,}460 \frac{lbs}{min} * (190\ F - 163\ F)$$

$$Heat\ utilized\ in\ the\ plant\ \frac{BTU}{min} = 39{,}808\ BTU/min$$

$$Heat\ utilized\ in\ the\ plant\ \frac{BTU}{hr} = 39{,}808 \frac{BTU}{min} * 60 \frac{min}{hr}$$

$$Heat\ utilized\ in\ the\ plant\ \frac{BTU}{hr} = 2{,}388{,}499 \frac{BTU}{hr}$$

$$Heat\ utilized\ in\ the\ plant\ MW = 2{,}388{,}499\frac{BTU}{hr} * \frac{\left(\frac{1}{3412142}\right)MW}{BTU}/hr$$

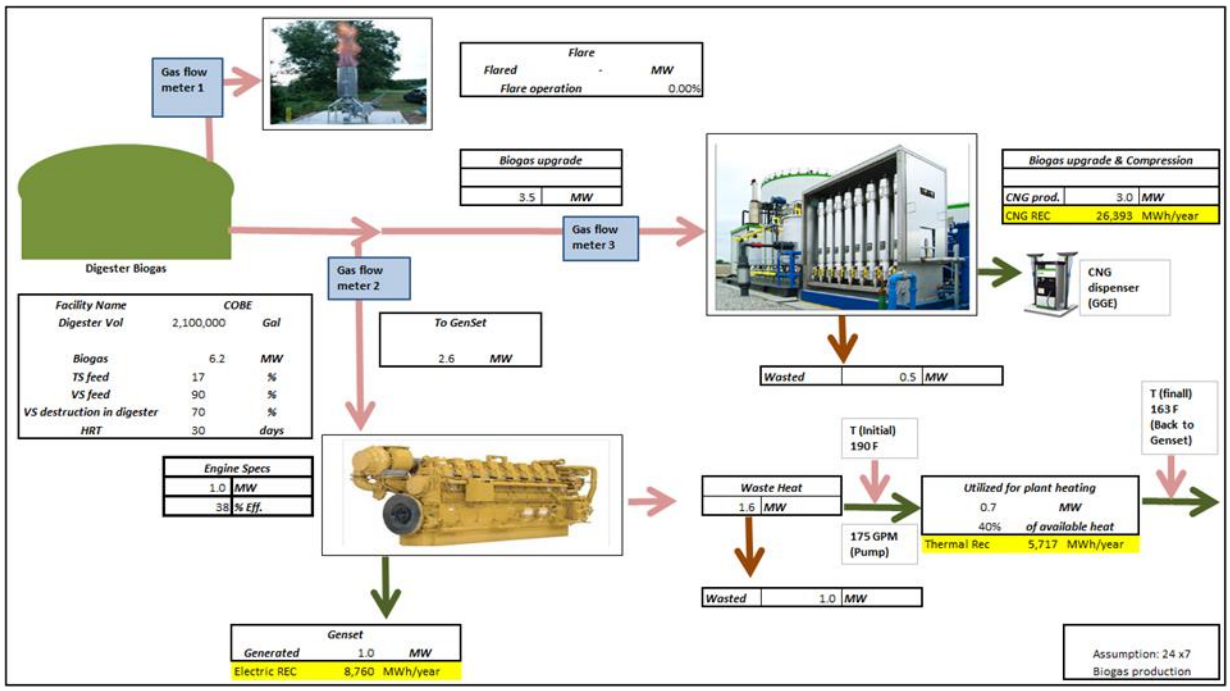
$$Heat\ utilized\ in\ the\ plant\ MW = 0.7\ MW$$

$$Thermal\ REC\ \left(\frac{MWh}{yr}\right) = 0.7\ MW\ (Thermal\ utilization) * 24\frac{h}{day} * 365\frac{days}{yr}$$

$$\boldsymbol{Thermal\ REC\ \left(\frac{MWh}{yr}\right) = 5{,}717\ MWh/year}$$

13. For Section G.3 of the application, please explain the methodology used for measuring, calculating and verifying the thermal energy used in the facility.
See response to 12 above.

14. Provide a process flow diagram which includes the proposed locations for the thermal meters, as referenced in response to question G.3. of the application.



15. For Section I of the application, please indicate the maximum amount of RECs that will be created through the generator set, heat, and biogas for this facility.
8,760 MWh/year Electric (maximum genset capacity)
5,717 MWh/year Thermal (maximum heat capture capacity)

The above values are maximum outputs based on the utilization equipment as a limiting factor. Thermal credits can only occur when electricity is being generated.

For Section I.1, the applicant projects thermal generation of approximately 3.27 mmBtu/yr. Is this accurate or is that meant to be an hourly output? What numerical conversion factor is the applicant proposing in order to convert those mmBtu into a MWH equivalent for purposes of REC creation?
5,717 MWh/year Thermal (maximum heat capture capacity) is the correct number. See response to 12 above for calculations.

16. For Section M, the applicant indicated that the system is grid-connected, but did not list the company with whom the facility is interconnected. Please list that entity.

American Electric Power

17. For Section N, please identify the meter depicted in the attached photograph and the type of output it is measuring.

We will add: Proline Prosonic Flow B 200 Ultrasonic flowmeters. The device for accurate, reliable biogas measurement with loop-powered technology. Attached, are specifications. Accuracy is as follows:

Measured variables	Volume flow, corrected volume flow, corrected methane volume flow, energy flow, methane fraction, calorific value, temperature
Max. measured error	Volume flow (standard): - ±1.5 % o.r. for 3 to 30 m/s (9.84 to 98.4 ft/s) - ±3 % o.r. for 1 to 3 m/s (3.28 to 9.84 ft/s) Volume flow (option): - ±0.1 % o.f.s. for 0.3 to 1 m/s (0.98 to 3.28 ft/s) - ±1.5 % o.r. for 1 to 30 m/s (3.28 to 98.4 ft/s)