

Webinar Q&A

How to Choose Renewable Natural Gas (RNG) Partners

What agreements do you need to ensure a successful project?

Question: Are the substrates permitted to be added under the RNG programs?

Mark Stoermann: Yes, substrate, generally food wastes, can be added under both the RFS and LCFS program. Both programs do discount the value of the gas from substrates.

Question: Is there an opportunity to install solid-liquid separation post AD for the digestate? If so, which solid-liquid separation equipment fits well?

Mark Stoermann: Yes, many digesters are designed with solid-liquid separation systems to recover solids for bedding and to reduce the solids going into the lagoon. Typically, the separation equipment used is the same as that used with manure that has not been digested, screw presses, slope screens, and rotary drums for example. For more information on course solids separation technology see the Newtrient Solutions Catalog (<https://www.newtrient.com/Catalog/Dairy-Manure-101>).

Question: Does a covered lagoon digester produce the same quality of digestate as e.g. a complete mix unit? Same odor/pathogen reduction, etc?

Mark Stoermann: Because the solids are typically removed from covered lagoon digesters before digestion there is a difference in the digestate. Typically, the odor reduction will be similar to that of other digesters if the temperatures do not get too cold in the region but the pathogen reduction may not be as significant as the temperature never gets high enough to significantly change the bacterial population.

Question: Is the hydraulic retention time a function of reactor type and design or substrate? If it is a function of substrate, why is it listed with the designs?

Mark Stoermann: Technically the hydraulic retention time (HRT) is simply a calculated number that is reached by the volume of the digester in gallons divided by the daily flow in gallons. There are some substrates that take longer to digest than others so that may affect the design of the digester but typically CSTR and Mixed Plug Flow digesters are designed at 20-25 days HRT and covered lagoon digesters are designed with about a 40 day HRT.

Question: What are options for financing these projects?

Mark Stoermann: The Newtrient/AgSTAR webinar scheduled for November 10th - "Permitting, Contracts & Financing for Renewable Natural Gas (RNG) Projects" should provide the answer to your question. No spoilers 😊

Webinar Q&A

How to Choose Renewable Natural Gas (RNG) Partners

What agreements do you need to ensure a successful project?

Question: Are you suggesting from your monetary example that a bad running digester makes more money?

Mark Stoermann: The LCFS was developed to provide incentives to replace those systems that were in place before a digester was added that emitted the most greenhouse gas (GHG). Those systems that did not emit as much GHG, before digester, do not receive as low a Carbon Intensity (CI) score as those that do. This being said, a poorly designed and operated digester makes less money than one that is operated properly no matter what the CI score of the project is.

Question: By adding food waste, will the amount of gas produced make up for the credit moving to a D5 from D3?

Mark Stoermann: In some cases it does, in others it does not, each digester is different. For example, a smaller farm that produces 25% of its renewable natural gas (RNG) from manure and the remainder from food waste would not make as much money just generating RNG and getting D3 RIN's as it does generate D5 RIN's and getting tipping fees. Remember that a D5 RIN is worth about 50% of a D3 RIN. If the project is selling into an LCFS market these economics may change.

Question: Projects seem very sensitive to CI score and amount of reduction. Great gains are made in the initial reduction of a new system. How are these future years evaluated?

Mark Stoermann: The CI score is a before and after comparison. How manure was handled and what were the GHG emissions before the Renewable Natural Gas system was installed verses the GHG reduction that will be achieved by installing the system. To the extent that the system performs as it was designed and when audited is meeting the preliminary estimates there should be very little adjustment to the CI score.

Question: Mark, is anyone at Newtrient following technology development for biomethanation (university, academia driven) for additional carbon reduction and greater AD Biogas yields?

Mark Stoermann: At this point the development of biomethanation systems has not yet been scaled to the commercial level and as such it is not included in the Newtrient Catalog and not part of our RNG modeling. At the point where we have systems that can operate at a commercial scale, Newtrient will certainly try to determine the value of these systems to dairy digester projects. It is important to note however that these systems will not reduce emissions from dairy digester projects as the CO₂ from dairy digesters is not fossil fuel derived and is not adding to the quantity of CO₂ in the

Webinar Q&A

How to Choose Renewable Natural Gas (RNG) Partners

What agreements do you need to ensure a successful project?

atmosphere. It was originally in the atmosphere and converted by photosynthesis into plant matter.

Question: Most of the dairy digester projects in this state co-digest. So, I have two questions:

- 1) Is there any movement on the RIN forefront to reverse the financial penalties for generating D5 vs D3 RINs?**

Mark Stoermann: There are many organizations, such as the American Biogas Council (ABC), that are trying to work with the EPA to simplify the separation of D3 and D5 RINs when manure and food waste are co-digested but at the time of this webinar there has not been a change in the RFS rules.

- 2) We are also getting a lot of pushback from dairies who are under immense economic pressure and who do not want to engage in any additional projects requiring either CAPEX or OPEX. So, what can we do to foster collaborative/cooperative projects among smaller farms to capitalize on economies of scale and also bring in regional food waste for greater RNG generation?**

Mark Stoermann: The challenge with smaller operations and food waste is that there isn't a real market for the renewable energy from these systems. By that I mean a stable long-term market with a high enough price that allows projects to be profitable. Smaller operations are better candidates for renewable electrical energy than for RNG. The cost of electricity has been driven down by low gas prices as well as solar and wind development. If the price of electricity from these projects were similar to the prices seen in Vermont under the "Cow Power" program, we would see significantly more projects on these operations. If the LCFS has shown us anything, it has proved that with the right market, outside investment in renewable energy projects is available.

Question: Can you elaborate on the dried digestate? It is referred to as peat moss. Can it be sold as a peat moss substitute?

Mark Stoermann: Dried digestate, all the solids from a digester with the moisture removed, is not a peat moss replacement. You can make a peat moss replacement from digestate by separating the coarse solids from the fine solids and then composting them and adding other ingredients. There are several studies that have been conducted using composted dairy manure, in most of these studies plants grown in mixes including manure compost "...had weights and nutrient levels that were equal to or higher than those grown in peat moss".

Webinar Q&A

How to Choose Renewable Natural Gas (RNG) Partners

What agreements do you need to ensure a successful project?

Question: For all the types of digesters listed and the operational/construction numbers are they all mesophilic? any thermophilic? and other manure numbers: swine? poultry?

Mark Stoermann: Most manure digesters are operated at mesophilic temperatures, the exception being covered lagoon systems which are generally operated at ambient temperatures. There has been some work on using thermophilic systems but the higher temperatures make these systems more expensive to heat and they are less forgiving in the event of an upset.

Digesters are used for both swine and poultry operations. According to the [EPA AgSTAR website](#) there are currently 273 operational projects in the United States (March 2021)

- ▶ 221 Dairy
- ▶ 45 Hog
- ▶ 8 Poultry
- ▶ 9 Beef

Note: Total exceeds 273 because some systems accept manure from more than one animal type.

Question: Nutrient content in digestate was mentioned why isn't fertilizer on the opportunity list i.e., only compost and bedding?

Mark Stoermann: Digestate is generally land applied as a fertilizer. In most cases, because of the dilute nature of the products the value as a fertilizer is offset by the transportation or drying costs. Until there is a better market for recycled nutrients the opportunity for sale of digestate will likely remain limited.

Question: PFAS content in land applied biosolids is becoming a big concern? Is it an issue for reuse of manure digestate for land application or spray irrigation?

Mark Stoermann: The U.S. dairy industry needs to be aware of the PFAS issue. There are two dairies in two very different regions of the country that have received most of the attention and the sources of PFAS contamination differed in each case. Highland Dairy, near Clovis, New Mexico, was a 4,000-cow dairy located near the Canon Air Force base with a known PFAS contamination issue. Water and silage ingested by the cows were identified as sources of PFAS contamination. At Stoneridge Farm in Arundel, Maine, the contamination culprit is believed to be the long-term (1983-2004) cropland application of biosolid sludge from two municipal wastewater treatment plants. That led to elevated PFOS levels in soil and water ponds in cattle pastures.

Webinar Q&A

How to Choose Renewable Natural Gas (RNG) Partners

What agreements do you need to ensure a successful project?

According to the EPA website, per- and polyfluoroalkyl substances (PFAS) are a group of man-made chemicals that have been manufactured and used in a variety of industries around the globe, including in the United States since the 1940s. These chemicals are very persistent in the environment and in animal tissues – meaning they don't break down and they can accumulate over time.

PFAS can be found in:

- Food packaged in PFAS-containing materials, processed with equipment that used PFAS, or grown in PFAS-contaminated soil or water.
- Commercial household products, including stain- and water-repellent fabrics, nonstick products (e.g., Teflon), polishes, waxes, paints, cleaning products, and fire-fighting foams (a major source of groundwater contamination at airports and military bases where firefighting training occurs).
- Workplace, including production facilities or industries (e.g., chrome plating, electronics manufacturing or oil recovery) that use PFAS.
- Drinking water, typically localized and associated with a specific facility (e.g., manufacturer, landfill, wastewater treatment plant, firefighter training facility).
- Living organisms, including fish, animals and humans, where PFAS have the ability to build up and persist over time.

According to experts, unless a dairy is located near a potential source of contamination by PFAS or there has been a history of biosolids being used from a facility that process' high PFAS wastes, the risk is relatively low. If PFAS is present it will accumulate in the water and feed and subsequently appear in the milk. Digesters do not do anything that would destroy PFAS, typically only incineration does, so the danger of using digestate would be the same as the danger of using raw manure from a contaminated dairy.

Question: If you are separating solids--that will ultimately go to the digester--to clean up water for reuse in a "Closed Loop" to charge a flume or flush, does this increase your CI score?

Mark Stoermann: If the solids ultimately are sent to the digester the only impact that a solids separation system would have is the power usage if not from a renewable source.

Question: What are the advantages/challenges for a farmer to evaluate an opportunity to sign a contract with a private company building/running a community digester? One adv is the farmer doesn't have to operate the digester/separation technology. Company takes headaches of permitting, the ups/downs of the market prices.

Webinar Q&A

How to Choose Renewable Natural Gas (RNG) Partners

What agreements do you need to ensure a successful project?

Mark Stoermann: The Newtrient/AgSTAR Webinar October 27 “How to Choose Renewable Natural Gas (RNG) Partners” will cover this topic in greater detail, but generally the advantages are lower risk, lower capital cost and less direct involvement in the project. The disadvantage is that there will likely be less return, a long term commitment to a project with little input and the association with a project that may or may not be seen in a positive light in the long term.

Question: For your manure cost examples at 350 cows....is the increased cost per cow linear? 700 cows is "roughly" the same per cow? or is it non-linear and in the downward directions due to economy of scale?

Mark Stoermann: Most dairy related technology is not really linear; it is more of a step function than a per cow function. For example, it takes the same labor and similar equipment to scrape manure from a 350-cow operation and a 700-cow operation, the equipment may be larger and faster but the costs are not going to be double when you add it all together. Each farm needs to evaluate its own operational costs to truly understand their costs and opportunities.

Question: Has Newtrient developed a CI calculator to calculate a base line CI score for producers?

Mark Stoermann: Newtrient does not have a CI calculator, but we do have resources to help a dairy farm evaluate its CI score at a lower cost than doing it directly with some of the companies that do these evaluations.

Question: Mark, could you please elaborate the risk tolerance related question and give some more examples? Thanks.

Mark Stoermann: A renewable energy project is an investment. Like any investment you have to evaluate the risks and rewards of each of the options. Do I want to add to my dairy facilities or invest in renewable energy, how long a contract do I need to sign with a developer, am I confident in the markets for renewable energy and what is my long term goal for this project?

Question: Where does the cash come from to allow RINs and LCFS to pay more for RNG than for CNG?

Mark Stoermann: In the case of the Renewable Fuel Standard (RFS), Congress has mandated that the EPA administer the program which determines the amount of renewable fuels refineries must blend into the U.S. transportation fuel supply or alternatively they can buy RIN's to offset this volume obligation.

Webinar Q&A

How to Choose Renewable Natural Gas (RNG) Partners

What agreements do you need to ensure a successful project?

Question: What is the basis for the \$198 for fertilizer/nutrient value on your cost sheet? Does it reflect the sudden, rapid increases in fertilizer prices?

Mark Stoermann: The values for the fertilizer is the value of the nitrogen, potassium and phosphorous as published by the USDA-IL Dept of Ag Market News Service, Springfield, IL - Illinois Production Cost Report (Bi-weekly). I do not know the exact date of the report that was used for the slide in this particular presentation but believe it was late August.

Question: Can RNG projects co-exist or benefit from the current "buzz" re regenerative Ag/ enhanced soil health.

Mark Stoermann: Because RNG projects generate methane gas and carbon dioxide that is often lost to atmosphere during manure storage the effect of a digester does not have a significant effect on the nutrient content of the digestate and actually makes more of the nutrients plant available in the first year. If you consider the natural prairies of the United States which built up the topsoil of some of the most productive farmland in the world, the main ingredients were the grass fibers that remained after the season's growth, a small amount of manure from grazing ruminants and occasionally some biochar and ash from prairie fires. This is not all that different from the components of most digestate from dairy manure.

Question: Anyone commercially selling liquid?? digestate for peat moss replacement? I thought the by-product material needed to be "light and fluffy" similar to peat.

Mark Stoermann: Typically the dairy derived peat moss replacements are from digested course separated fiber or composted material that is mixed with other ingredients to create the "light and fluffy" material you have described.