Anaerobic Digestion Mini-Series

Episode 3 of 4 | October 2019

AUDIO TRANSCRIPT
"Digesters are Not a Perfect Tool."

Lindsay De May: Hello, and welcome back to our 4-part series about anaerobic digesters. I'm Lindsay De May, and I'm joined by ...

Austin Scarborough: Austin Scarborough.

Abby Bruzas: And Abby Bruzas.

Lindsay De May: From Vermont Law School's Farm and Energy Initiative. In the last two episodes, we talked about how anaerobic digesters work, and some of the environmental goals they can help us meet.

Abby Bruzas: And today, we want to shift our attention to why biodigesters might not be the perfect tool.

Lindsay De May: *[Sigh]* I knew it was too good to be true.

Abby Bruzas: Well, let's first deal with some of the more technical issues. Almost everyone we interviewed had something to say about the smell of the feedstocks and digestate, and that the operation and maintenance of digesters can be really difficult.

Austin Scarborough: This is Tim Taylor from Sacramento. He described a digester project that ran into nuisance complaints because of odor and poor maintenance.

*<<**Tim Taylor:** They didn't engineer it with a negative air pressure containment site where they were, the food waste would be dumped. So that right off the bat you started to having an odor issues, and then they didn't build it robustly enough so that you wouldn't have this smell, that, that vomit smell getting out of some of the pressure*

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valves at the top of some of the tanks. So they had, they just had issues with, with nuisance. It caused the problem with the neighbors.>>

Lindsay De May: But It seems like there's a difference between a well-run and maintained digester and one that's not. Vomit smell seems like very valid concern to not smell when I'm in my backyard Barbequing.

Austin Scarborough: That's a fair point. And that's why the best places for digesters are often on land that's already in use for a smelly purpose, like a farm, landfill, or waste water treatment plant.

Abby Bruzas: Digesters can smell, but they are also used to control odor. Digested manure smells a lot better than fresh manure. That's why proper management is so important, if properly maintained they shouldn't smell… too offensive.

Austin Scarborough: Yeah owners will often hire someone to operate their digester, here's Lauren Kahle-- she operates the anaerobic digester at Stahlbush Island Farms in Oregon, to talk about what they look for in a digester operator.

*<< **Lauren Kahle:** When we hire operators, we, um, are trying to look for people who have experience with system controls and equipment operation and things like that. And we do have a pretty extensive training period before we would put somebody on their own shift. There's a lot going on biologically and mechanically and so people need to be, um, you know, really aware of those things as well as the safety aspects before jumping into operation.>>*

Lindsay De May: Digesters are complex enough for… an extensive training period?

Austin Scarborough: Ohhh yeah, the machinery can be a lot to take care of. Bill Crossman from Vermont Technical college told us a little more about his system.

*<<**Bill Crossman:** So there's probably 25 pumps and motors and lots of electronics and yeah, tanks and the engine itself is complicated and has control systems and gas pressure sensors that fault. The entire complex probably has 50 to 100 different sensors that can go bad. >>*

Lindsay De May: With all of those moving parts, I bet digesters require a lot of upkeep.

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Abby Bruzas: Yeah with all of those control systems, the digester requires near constant monitoring, which is one reason a trained operator is really important.

Austin Scarborough: Digesters actually pose a pretty significant fire risk, methane is highly flammable and if the gas pressure builds up too much and combines with oxygen, BOOM! They can actually explode.

Lindsay De May: Isn't that when we'd have to flare off some gas?

Abby Bruzas: Exactly, and it's the operators job to monitor that pressure and flare if they have to. But they aren't making the decision all by themselves. Digesters often have a digital control system to monitor all of those sensors and processes.

Austin Scarborough: Operators have more to think about than keeping the mechanical pieces in working order, they also must carefully balance the biological piece of the machine - the bacteria.

*<<**Chris Cox:** You're putting all your feed stocks into the blending tank, and then you're feeding the two digesters from the blending tank because you don't want to shock them with, say you got really low BOD, something like really low in organics and then all of a sudden you're feeding it something that's a million milligrams per liter bod and it was before the last week you've been feeding it 10,000 milligrams per liter. It'll, it'll shock the system and it can, it, you can kind of, it's like flip a digestor where they go sour. It's like your stomach when you eat too much at once and then you need to start taking tums. We have to add sodium bicarbonate, 50 pound tums. It's literally like, I mean it works exactly like your stomach.>>*

Abby Bruzas: Sometimes the added work of monitoring and maintaining the digesters is just too much work for the farmers and waste district managers, and hiring an expert to do it is an extra added cost.

Lindsay De May: We've heard a few experts talk about the costs to get a digester off the ground- but how high is that?

Abby Bruzas: We talked to Patty Lovera from Food and water watch, an NGO focused on government accountability surrounding food and water, about why they are concerned about the use of digesters. Investment is one major reason.

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<<Patty Lovera: What we're seeing now, like the real hype is not about generating electricity on the farm. It's about collecting the gas and transporting the gas elsewhere. And so different parts of the country, it's for different things. Some places are talking about we can turn it into fuel for buses. Some places this is about building pipelines to gather the gas a to take it to a power plant to burn. So there's going to be different costs for all of those different scenarios. But from what we've seen, um, you can spend hundreds of thousands of dollars on a digester, up to millions of dollars on a digester. >>

Lindsay De May: That's certainly not pocket change...

Austin Scarborough: And costs only go up from there depending on how you plan to use the biogas. If you're going to generate electricity, you'll need to invest in generators and connections to the grid.

*<<**Eric Fitch:** It's actually pretty expensive to use the biogas. First, you have to treat it so that you can use it. There's a certain upfront overhead cost associated with that cleanup and then let's say you were going to make electricity with it. You've got all the costs associated with grid connection and an offtake agreement that really are not related to the scale of system. All those costs you can imagine would be a quarter of a million dollars to interconnect to the grid. If you have a small generator, it takes a long time to get that payback. But a larger generator can get that payback quicker. If it's complicated, like for instance maybe there's no three phase power on site-- this is something that you might encounter with a farm installation. You might have to put in miles of three phase power. That's really expensive. We were looking at a project one time farm in St. Albans and it was going to be $1.2 million for the interconnect cost. We ended up not building that project. And you know some of the things like that interconnect cost in the economics were in part why we didn't develop it.>>*

Abby Bruzas: And if you want to upgrade it to pipeline-quality natural gas you'll have to get machinery that cleans the gas *and* build in access to a pipeline, which likely requires some additional construction.

*<<**Patty Lovera:** It seems like we're just starting to see their proposals where they would build pipelines to go gather that gas. And it really depends on the geography. If there was a pipeline that was nearby, they can tie into it. If they're building new pipelines, building a natural gas pipeline is very expensive. You could be spending*

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millions of dollars per mile to build a pipeline, so it really depends how they set it up. >>

Lindsay De May: Woah! Pipelines are EXPENSIVE... I assume farmers don't usually have that kind of money lying around. Where do they get it from? Who pays for these?

Austin Scarborough: According to Patty, a lot of publicly funded grant money is currently being directed toward on farm digester development.

Lindsay De May: But, grants can be really difficult to get, not to mention they take a while to prepare and hear back. What about taking out loans. Is that a viable option?

Austin Scarborough: It is. But Patty says they can be really tough for farmers to pay them back, even once the digester is up and running.

*<<**Patty Lovera:** I mean cause milk prices are terrible. Would these guys go take a loan to do this and now we can't pay that loan back cause he didn't make enough from whatever power he's generating or he did, it depends what state he's in, but milk prices aren't paying for anything. So, there's so many questions about whether it makes sense.>>*

Lindsay De May: Hmm, sounds like there's pretty hefty financial risks involved in digester development - definitely more than I expected.

Abby Bruzas: And that's really just in building the digester. Additional costs extend into the reliability of feedstock and proximity to the digester. Even if you know how to keep your bacteria happy, you must constantly bring in organic materials, otherwise…

Austin Scarborough: You might have to shut it down!

Abby Bruzas: At least temporarily, until you get the feedstocks.

Lindsay De May: And then when it's shut down, you can't produce biogas or energy to sell, so you're going to lose even more money...and your bacteria are going to die.

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Austin Scarborough: A lot of managers run into the problem of securing feedstocks. Including Bob Spencer, the director of the Windham County Solid Waste Management district. The district is a perfect location for a digester.

Abby Bruzas: Right, the waste management district already accepts most of the waste you can think of-- compost, trash, recycling.

Austin Scarborough: And the business is located next to a closed landfill, where landfill gas was captured to run a generator and make electricity. That worked until the landfill started to run out of gas…

Lindsay De May: Isn't that a good thing? That the landfill isn't emitting so many gases?

Abby Bruzas: It is! But it means there isn't enough gas left to run the generator. So that expensive grid connection and generator are just sitting there. And Bob received a grant to put in a digester on the same site to put that equipment to good use.

Lindsay De May: Awesome. How did that work?

Abby Bruzas: Well, it didn't. He had to return the grant money because he was unable to secure contracts for feedstocks.

*<<**Bob Spencer:** The grant from ANR was for 40% of the total project costs. That meant the district had to come up with 60% of $1.2 million. We got awarded the whole project, the state says this is fantastic- we need this. My board, sitting around here, select board members. Many of them said, no way are we going to go out and borrow $800,000 and we don't even know if we're going to get that food waste. Show me a contract, Bob, from CNS wholesale grocery, show me a contract from Commonwealth dairy. Show me. And we couldn't get any of them to contract.*

***Genevieve Byrne:** Why do you think they're not willing to contract?*

***Bob Spencer:** Because the developers would want at least a seven to 10 year contract at a certain price, put or pay. And these companies feel that, that their stuff's going to be valuable and they'll, they feel that they might regret locking in. Major impediment is the failure to get long-term contract because you've got to finance these things. If you know that you've got a 20 year deal for all of someone's waste, you could walk into*

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People's Bank and finance it, because this is literally guaranteed. But for venture capitalists and others who are funding these AD plants, they need much lower risk. >>

Austin Scarborough: If you can't guarantee where your feedstocks will come from, and even get contracts for those feedstocks, you might not be able to get financing for a new digester project, even if you know there are organics out there that need to be managed.

Abby Bruzas: Dan Bell at Agri-Cycle ran into a similar problem. His company picks up feedstocks from all over New England to bring them to their digester in Maine.

*<<**Dan Bell:** We kind of naively assumed that food waste would just fall in. We had a renewable resource, we provide good economic and social benefits. We had a lower tip fee then, you know, landfill or incineration. But we realized pretty quickly that if we were going to build this market, we need to invest in trucking infrastructure and really get out there and explain to people what you can do with your food waste and how we can use it close to home here to create renewable energy and help sustain agriculture. So we invested in Agri-Cycle. We've vertically integrated and put trucks on the road. We run those trucks all around New England and the northeast. We have a variety of transport vehicles to make that happen. Right now we're serving customers throughout Maine, New Hampshire, Vermont, Rhode Island, and Massachusetts, and New York.>>*

Austin Scarborough: We asked Dan about those long hauling routes, which of course use up fuel and have emissions from the trucks. We were curious why they had to go so far for reliable feedstocks.

*<<**Dan Bell:** You guys are way farther ahead here in Vermont with, uh, legislation around food waste diversion. Actually their proposing legislation in Maine, uh, either this session or next session to increase their recycling rates. That's been one of the challenges that we've faced in Maine. I would say that probably 60% of the material we're processing is coming from other states versus our own state. So, when we formed Agri-Cycle, the goal all along is to hopefully move material the least amount of distance. And as we see that market place really develop in Maine, we expect that additional infrastructure will develop across the northeast. >>*

Lindsay De May: That *also* goes back to what we were saying in the first episode about why there are only about 500 digesters in the US. Without waste diversion laws,

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it's difficult to get feedstocks in the right proportion to keep the digester bacteria healthy.

Austin Scarborough: Way to bring it back to the beginning!

Lindsay De May: Hmm, well what about if you DO have access to a reliable source of food that's in the right proportions and won't kill your bacteria. BUT that reliable source is from a grocery store and the feedstock is from packaged breads, chips, yogurts? That seems like a lot of plastic for only a little feedstock.

Austin Scarborough: Packaged food waste- that is, expired or inedible food in its original packaging-- can be a major challenge for digester operators. Sometimes the food waste may even still be on a pallet, wrapped in plastic. This is Carolyn Grodinsky from Grow Compost:

*<<**Carolyn Grodinsky**: And for those that don't know what package food waste is, it's anything that is in a package. So that could be expired yogurt containers, it could be, uh, somebody mentioned a Butterball Turkey that's still wrapped up, a bag of onions, a bag of spoiled spinach. So basically anything in its package, but the majority of that item is food.>>*

Lindsay De May: Packaged food doesn't really sound like a good feedstock since the plastic wrapping can't go into the digester. What happens to this kind of waste? Do digesters have to hire people just to open and empty bags or containers of food?

Austin Scarborough: Actually, we have technology for this!

Abby Bruzas: Yup, they're called de-packagers. Some digester operators have invested in them on their site so that they can handle a greater variety of feedstocks.

Austin Scarborough: We just heard from Dan Bell from Agri-Cycle about problems getting feedstock in states without organics diversion laws. They increased the feedstock they could take by building one of the first depackagers in the northeast.

*<<**Dan Bell:** That's what really led us to research, you know, the Scott-Turbo separator, and install, the first one here in the New England area. Because we thought, well geez, that material is going to landfills. Why don't we capture that? And then, you know, we can help increase folks recycling rates and we can stream line services to*

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them at their stores. So in 2015 we installed the depackager. Essentially it uses a combination of uh, centrifugal force, paddles, and screens to separate out the packaging and create a food waste slurry. That food waste slurry is then pumped over to the digestor, where we build our recipe, and then fed into a process that I described earlier.>>

Austin Scarborough: Dan's really concerned about plastics and other contaminants left in his digestate because it's ultimately getting spread on farmland. There's a screening process he uses to keep as much of these contaminants out as possible.

*<<**Dan Bell:** We see a decent amount of plastics, but the machine does a very great job at removing that. We see over 99% removed and the other beneficial part to our process is that when we're pulling the material out of the contained domes, we're then pressing it through those two millimeter screens. So any of the other like little plastic fragments that sometimes come out get screened out in that solid fraction, and we're capturing that. So, it's very important to us that none of that material goes back on the land base or ends up in the stalls at the, uh, at the milking parlors.>>*

Lindsay De May: So these machines aren't perfect. I mean… anything that makes it through the 2 millimeter screen can still contain micro plastics that we could never filter out.

Abby Bruzas: Totally valid concern. And part of the reason those machines might not be good enough.

Lindsay De May: Plus, I'm sure any time new equipment is required, the price tag goes up.

Austin Scarborough: Yeah. Owning a digester can be really expensive, especially to launch. It makes sense that they would try to maximize the amount of biogas their system produces, so they have more energy to sell.

Lindsay De May: Of course! That's how they generate income!

Austin Scarborough: Buuuut, sometimes making more biogas means mixing together waste streams that should probably be kept completely separate.

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Lindsay De May: What do you mean mixing waste streams that should be kept separate?

Abby Bruzas: Well, when we send uncontaminated organics to a waste water treatment plant, it gets mixed with sewage-- then all of that material is considered biosolids.

Lindsay De May: Are biosolids different from digestate?

Abby Bruzas: They are different! Biosolids only come from waste water treatment plants. It's a special regulatory category because it contains human sewage. Digestate is what comes from a digester- and it doesn't HAVE to fall into that special category.

Austin Scarborough: But when a waste water treatment plant digester accepts uncontaminated organics, and those mix with human sewage in their digester, it ALL *becomes* biosolids.

Lindsay De May: How are you defining uncontaminated waste-- aren't all the feedstocks we've been talking about in this podcast more-or-less unusable?

Austin Scarborough: Unusable? That's another controversial question. Many feedstocks could be used as animal food, or even people food, instead of being used to make energy.

Abby Bruzas: That's why the organics diversion laws we talked about in episode 1 usually include a hierarchy of where these materials should go first.

Lindsay De May: So, energy production *should* come from the unusable leftovers.

Austin Scarborough: Exactly, But let's get back to your contamination question. We think of feedstocks as uncontaminated if they were never touched by people-- it's the difference between my half-eaten ice cream cone.

Lindsay De May: And that's contaminated-

Austin Scarborough: And an entire batch of Ben and Jerry's ice cream, where they didn't add enough chunks and swirls--.

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Lindsay De May: --That's pretty clean organics.

Abby Bruzas: And when we mix our clean organics in with biosolids, they become contaminated. We asked Josh Kelly at Vermont Agency of Natural Resources about the issue of biosolids contamination and reuse.

*<<**Josh Kelly:** Yeah. I mean I think it's a waste like anything else. And you know, we have landfill disposal bans in state statute. I'm not, I'm not recommending that we look at sludge and biosolids and recommend that they be banned from disposal. There are cases where biosolids can be beneficially used and it's economic to do so. And so a town in municipal waste water treatment facility prioritize doing that. They compost them, they can treat them with lime, it's a septic materials and then land apply them. The public has a lot of concerns about sludge-–everything from endocrine disruptors to now PFA. There is some truth to that. We do not have treatment systems for endocrine disruptors and hormones. >>*

Lindsay De May: So by mixing the untouched ice cream slurries with sewage, that makes all of it contaminated when it goes into a digester. But what's the problem with that then? I thought digesters are meant to break all these down, take out the biogas and leave safe-to-use digestate.

Austin Scarborough: Digesters aren't able to break down endocrine disruptors, antibiotics, or pathogens that enter through the waste water treatment system because we don't really have the technology in place to remove them.

Abby Bruzas: Yeah, those are all really persistent meaning hard to break down and get rid of. If you take clean organic wastes, like industrial food waste, and combine them in a digester with biosolids it is more likely the digestate will be disposed of in a landfill because of this contamination.

Austin Scarborough: At the Montpelier facility they currently have to landfill all of their digestate, so by accepting clean organics from industrial waste streams, they end up making additional biosolids-- more biogas, but also more biosolids.

Lindsay De May: But are they really making more biosolids? These materials were probably headed to the landfill anyway. At least they are capturing useful energy before the materials are landfilled.

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Abby Bruzas: That's a good point, Lindsay. And as Montpelier goes through their organics-to-energy upgrade, one of the considerations is biosolids management.

*<<**Chris Cox:** Unfortunately we do landfill all of our biosolids at the moment. That's part of the upgrade is to be looking at, into what we can do with the solids moving forward. >>*

Austin Scarborough: If they heated their digester to a higher temperature or pasteurized their digestate, they could spread it because that would kill a lot of the pathogens.

Abby Bruzas: But the digestate would still contain heavy metals and endocrine disruptors that wouldn't be entering the farm system if you were spreading digestate from clean organics alone, or even synthetic fertilizers.

Lindsay De May: So, with the potential for contamination in digestate, and the fact that you're combusting methane, it seems like the permitting of digesters could get pretty complicated.

Austin Scarborough: Oh yeah, a digester operator may need a whole variety of environmental permits depending on the kind of feedstocks.

Abby Bruzas: And those can be pretty tricky to understand and even harder to obtain. We asked Dennis Fekert, from the Vermont Agency of Natural Resources, to help explain the challenges to permitting.

Austin Scarborough: He told us about the regulatory difference between a digester that takes post-consumer food scraps, like food waste from homes, and food processing waste from industrial sources.

*<<**Dennis Fekert:** If you're going to take a post-consumer food scraps, which is defined as a solid waste, then you need a solid waste facility. And we permit that pretty much the same way that you would permit a transfer station. You know, there's a notice to adjoining land owners, there's an application, there's some give and take, and then we write a draft certification and, and put it on public notice. >>*

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Lindsay De May: Okay so if you're taking consumer food waste you'll need a solid waste permit. That seems fair. How about if you'll be taking food and beverage industry waste?

*<<**Dennis Fekert:** There are many digesters that take what's called um, a food processing residuals, which is like your Ben and Jerry's waste, things of that nature. And those have ~~a~~ wastewater component to them. So they are regulated by the indirect discharge program. And basically what, let me call it, the speedometer on all these things, is the nutrient management plan of the farm. So, you have to look at what you're bringing in. What's the nutrient load of the waste that you're bringing into the farm? Once you've processed it through your digester, now you have solids and you have liquid. The liquid, generally speaking, is land applied. We have to know what the nutrient load of that liquid is, and so that therefore it has to fit within the parameters of your approved nutrient management plan.>>*

Lindsay De May: If I want to put a digester on my farm and I'm only using agricultural waste, I just need to make sure I'm abiding by my approved nutrient management plan.

Abby Bruzas: Yes. And, you may need more permits depending on your use of the biogas. For example, in Vermont, you need a certificate of public good from the state public utility commission if you want to generate electricity.

Lindsay De May: Oh yeah, these different permits are already a lot to keep track of.

Austin Scarborough: Yeah, the waste and discharge permits change based on your feedstocks. But digesters are also going to need air pollution control permits that require different emissions control technology depending on how you use the biogas.

Abby Bruzas: This is because anaerobic digesters do emit greenhouse gases, namely methane and carbon dioxide, as well as other hazardous air pollutants. This is Tim Taylor, from Sacramento:

*<<**Tim Taylor:** Classically you'd have some kind of reciprocating engine generator, you know, a backup generator or something like that, and there's an emission standards associated with that backup generator can emit. And so, every type of technology-- boilers that are operated and industrial buildings, for heat and, and*

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whatnot. There's a standard associated with what you can have emitted by a technology. Same thing's true of digesters. So there are standards that are associated with what's permissible to be emitted. >>

Abby Bruzas: Many biogas producers generate electricity on-site with reciprocating engines, gas turbines, and microturbines, all of which emit air pollutants. Unless these projects use hydrogen sulfide controls and engine exhaust emission controls, they are really notable sources of air pollution.

Lindsay De May: So even though they're considered renewable technologies, digesters still need to obtain permits similar to nonrenewable sources?

Abby Bruzas: That's right, because at the end of the day they are still emitting toxins and greenhouse gases, so they are regulated by the same legislation. But for now, we just want to say that the specific use of the biogas can significantly change the emissions profile of digesters, from both the choice feedstocks to the choice of flaring biogas, combustion for heat or electricity, or upgrading for use as a transportation fuel.

Austin Scarborough: I think one of the bigger concerns is that investments in this technology will prop up environmentally degrading industries like natural gas fracking and factory farming.

Lindsay De May: So what you're saying is digesters could be greenwashing farming and fossil fuel industries.

Abby Bruzas: Exactly, and for those who are unfamiliar to the term greenwashing, here's Patty Lovera from Food and Water Watch to define it for us

*<<**Patty Lovera:** Yeah, so greenwashing is a term that gets used as shorthand essentially for when an industry that has negative environmental impacts, or is doing something that isn't positive for the environment, tries to kind of put a green aura, or a green halo, and say no, what we're doing is somehow beneficial to the environment. >>*

Austin Scarborough: The reason we need to consider industrial greenwashing is because most anaerobic digesters in the US are used for manure management at concentrated animal feeding operations.

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Lindsay De May: Is that CAFOs?

Austin Scarborough: Yup. Many people have concerns that helping CAFOs better manage their manure contributes to the success of that agricultural practice.

*<<**Patty Lovera:** Many years ago you would hear about this concept of digesters as somehow a solution, supposedly, to the problem of, you know, you concentrate those animals and you're concentrating their waste to, and there's lots of aspects to the factory farm issue, but the waste is a huge, huge piece of it. We don't think that the technology of having a methane digester solves the rest of the problems. It might address that one piece of methane, but it doesn't solve the rest of the problems that we see coming from having so many animals in one place. So we've never really bought into it being enough of a solution, or a real solution, to the overall problem of factory farms.>>*

Abby Bruzas: On the other-hand, a lot of people think we should continue to build digesters on CAFOS because they improve some environmental impacts, while at the same time, work with industrial farms to shift production practices to be more environmentally friendly.

Austin Scarborough: Digesters are not a solution for factory farms, but they can make the industry pollute less. Here're Nora Goldstein explaining why she sees a potential role for digesters both at CAFOs and smaller dairy or livestock farms.

*<<**Nora Goldstein:** It's rough when you go onto a hog farm, and see house after house after house, and, you know, look at the reality. But the long and the short is that, in our agricultural economy and, right now these, this is what has evolved because of scale and efficiency and the vertical integration of these companies. But if these things exist, you want to really manage the manures in a way that keeps them from polluting streams, causing algal blooms. Especially for the smaller dairies and some of the smaller operations, the digesters truly make their dairy farming slightly more economically viable.>>*

***Nora Goldstein:** You know, one could ask that question of a lot of concentrated industries, and as long as we have them, we need to minimize their footprint.>>*

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Lindsay De May: Okay, so the decision to use digesters at factory farms, or CAFOs, is a really complicated question-- it helps manage manure, but it also makes those farms seem more sustainable than they are.

Austin Scarborough: Similar concerns about greenwashing come up almost anytime we use biogas as a replacement for natural gas. The question is whether biogas can meaningfully displace natural gas from fracking or petroleum as a fuel.

Abby Bruzas: This especially becomes a concern when we inject renewable natural gas into our existing gas pipelines, and when we need to build additional pipelines in order to connect with sources of renewable natural gas, even to new biodigesters.

Lindsay De May: Ok, but what if the new pipe was just for renewable natural gas?

Austin Scarborough: Well, the short connecter pipe might only take renewable natural gas, but ultimately all of our gas pipelines are "open access."

Lindsay De May: Meaning open to any kind of natural gas, even if it comes from, let's say, fracking?

Abby Bruzas: Exactly. We can't guarantee that any new pipelines will *only* be used for renewable natural gas-- because pipeline owners aren't allowed to exclude certain users in favor of others. So, there is a concern that biogas could be an excuse for further natural gas development.

Austin Scarborough: Right, as more digester owners want to upgrade and inject biogas into the gas grid, pipeline companies have the opportunity to expand their infrastructure. Here's Patty once more to speak to why that could easily backfire.

*<<**Patty Lovera:** We don't need to be investing in gas pipelines, no matter what the source of the gas is. Because we also-- the cynics that we are, I think that if there's a bust in this, you know, this boom of renewable natural gas, the gas industry will happily fill those pipelines with fracked gas. Right? Once they've built them, they have to fill them. So we're worried about that. But if we have lots and lots of money to invest in energy infrastructure we don't think we should be investing in a gas pipelines, right? Which is, like, fossil fuel infrastructure.>>*

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Lindsay De May: So Patty is saying pipelines would just fill up with fracked gas anyway. Could we fill up those pipelines with renewable natural gas instead?

Abby Bruzas: Not really. Even if we used ALL of our current sources of renewable natural gas, it wouldn't meet the total natural gas demand in the US. So, when we inject renewable natural gas into the pipeline, we are supporting fossil fuel natural gas infrastructure.

Austin Scarborough: But not everyone thinks about this exactly the same way. In the last episode, Tom Murray told us about Vermont Gas Systems' renewable natural gas program, which he sees as helping to transform our use of fossil fuel infrastructure:

*<<**Tom Murray:** We all know the world we're living in about changing, standards around decarbonization, renewal, and things like that. And so, we're doing this to address climate change. You know, that's our sincere belief. We think these are a way- a path forward for our infrastructure to do something other than deliver, you know, fossil fuels. >>*

Lindsay De May: And aren't companies like Vermont Gas Systems actually reducing the amount of fossil fuel gas we rely on? It seems like that makes an environmental difference.

Abby Bruzas: Yeah, it does. When we use renewable natural gas, it can replace gas from fracked or fossil fuel sources. But we need to think about the best ways to use this technology.

Lindsay De May: How so?

Abby Bruzas: We may see bigger benefits from using biogas for local heat and electricity. It doesn't require building any pipelines or using up energy to compress or liquify the gas so that it can be transported long distances to be used somewhere else.

Austin Scarborough: I personally think biogas is most useful for those electric grid reliability benefits we talked about in the last episode.

Lindsay De May: Hmm, so why are so many projects upgrading their biogas to renewable natural gas *instead* of using it for local heat and electricity?

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Austin Scarborough: To understand that, Abby and I should probably explain the federal incentives for renewable transportation fuel.

Abby Bruzas: First of all, there is a federal law called the Renewable Fuel Standard, or RFS, which was developed by the EPA to encourage converting wastes, like manure and food scraps, into fuels.

Austin Scarborough: The RFS requires that a certain volume of renewable fuel is used to replace gasoline and diesel used in the U.S. each year.

Abby Bruzas: Every year, the EPA calculates the percentage of transportation fuel that has to come from biofuel based on how much total transportation fuel we expect to use that year.

Austin Scarborough: Then, they split up this total amount between companies that import, refine, or blend our transportation fuel. Each company is assigned a "renewable volume obligation" or RVO, which tells them how much renewable fuel they are responsible for obtaining.

Lindsay De May: How do we keep track of who's met these obligations and who hasn't?

Austin Scarborough: It all starts with something called a RIN-- or renewable identification number. Whenever a gallon of eligible biofuel is produced, it is assigned a RIN.

Lindsay De May: What's a RIN?!

Austin Scarborough: RINs are certificates, or ID cards, that identify the renewable fuel, and can be bought and sold separately from the fuel itself.

Abby Bruzas: And when a fuel blender or refiner blends that renewable fuel into gasoline or diesel, it claims the RIN.

Austin Scarborough: Then they can "retire" the RIN, which means they used it up to comply with their Renewable Volume Obligation. If they have more RINs than they

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need to meet their RVO- they can sell the RIN to someone who doesn't have enough. And that means RINS are basically worth money!

Lindsay De May: Sounds like RINs are a kind of currency for the Renewable Fuel Standard...

Abby Bruzas: That's a great way to think about them. Together, RINs and RVOs are the EPAs tracking and enforcement program for the Renewable Fuel Standard.

Lindsay De May: Alright, it's getting to the end of this episode and I'm struggling to keep all these acronyms straight! What's the relationship between RINs, RVOs, transportation, and injecting renewable natural gas into the pipeline? It all seems kinda convoluted.

Austin Scarborough: No worries, there are a lot of acronyms to keep in mind.

Abby Bruzas: Oil refineries and fuel importers have to comply with the RFS by either blending renewable fuel into the existing fuel supply OR obtaining enough RINs to cover their required amount of renewable fuel. That OR is particularly important.

Austin Scarborough: Let's hear from Eric Fitch from Purpose Energy about how this affects the digester industry.

*<<**Eric Fitch:** There's this property called displacement, where if i put natural gas into the pipeline, in say for Vermont, I can sell it to somebody on the pipeline in California. And if that somebody in California happens to be a fueling station, then we can take advantage of these things called RINs, which are renewable identification numbers. But, it's an incentive for renewable transportation fuel. In California, additionally, there's a low carbon fuel standard that applies. So the value of the RINs and the low carbon fuel standard are an order of magnitude greater than the value of the fuel that you're providing. Through those incentives, people are finding ways to build their digesters with a higher revenue potential then they used to, and that's, I guess that's a big trend that we see.>>*

Lindsay De May: Okay, so you could actually blend the fuels together OR you could just buy the RINs?

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Abby Bruzas: Exactly. Just like currency, because they can be bought or traded to help companies comply with the renewable fuel standard.

Austin Scarborough: RINs act like proof that renewable fuel was blended into our existing supply.

Lindsay De May: Bringing this conversation back to digesters...

Abby Bruzas: Well, for a digester to get a RIN, the project has to be able to demonstrate where their renewable fuel came from-- or show the exact pathway the project took from feedstock, or waste, to renewable transportation fuel.

Austin Scarborough: And the EPA has to approve each of these specific pathways.

Abby Bruzas: And it has already approved pathways to get RINs from turning biogas from agricultural digesters, waste water treatment plants, and landfills, into compressed or liquid natural gas .

Austin Scarborough: Here's the issue. In order to be turned into compressed or liquid natural gas, the biogas usually has to travel through a pipeline to get to the companies that compress or liquify it.

Lindsay De May: What if I use all the biogas onsite for heat or electricity. Would I still get the RIN, since that's also reducing the amount of fossil fuel we use?

Austin Scarborough: Unfortunately not. You would if the RFS were just aimed at reducing fossil fuel use anywhere. But the policy is intended to clean up our transportation fuel.

Abby Bruzas: The fact that RINS are worth money means companies are more likely to develop biogas in a way that creates a RIN.

Austin Scarborough: And for now, this means cleaning up the biogas and transporting it through a pipeline to a compression or liquifying facility, so that it can be turned into transportation fuel-- because that's how they get the RINs.

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Lindsay De May: So RINS may discourage using biogas on site and encourage scrubbing the gas to put it in the pipeline so it can ultimately be used for transportation?

Austin Scarborough: Exactly.

Lindsay De May: I heard Fitch mention some special fuel standards in California, too. How are those different from the federal law?

Abby Bruzas: So, California has a law called the Low Carbon Fuel Standard, which works similarly to the federal renewable fuel standard. Biogas projects can receive low carbon fuel credits for replacing more carbon-intensive fuels. And the more carbon reduction is achieved along the whole fuel supply chain, the higher the credit.

Austin Scarborough: Here's Tom Murray, explaining a bit more about why using biogas for transportation can result in a carbon negative fuel. "Nox" refers to Nitrogen oxides, which produce ozone, another greenhouse gas.

*<< **Tom Murray: E**lectric vehicles are really the replacement for passenger vehicles. And you get into the heavy duty sector, the best solution for a lot of these folks is to transition to CNG with renewable fuels. So what they get out of that, the new CNG engines are zero NOx basically. So you can go carbon negative, so you get a zero Nox engine. So you're not only are you using renewable fuel, reducing your Nox, reducing your costs, but you're also potentially going carbon negative.>>*

Lindsay De May: I mean, that sounds pretty good. Don't we want to reduce the carbon intensity of the fuel we use?

Austin Scarborough: We definitely do. It's important that California is considering the entire fuel production pathway, and working to transition to cleaner fuels.

Lindsay De May: So what's the problem?

Abby Bruzas: Well, for renewable natural gas produced out of state to qualify for California credits, the renewable natural gas has to be sold to a company with dispensing facilities or a vehicle fleet in California.

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Austin Scarborough: Or the gas can be injected into a natural gas pipeline with the ability to flow to California.

Lindsay De May: So again, it incentivizes pipeline injection and transportation uses, even if that means transporting the renewable natural gas itself over really long distances.

Austin Scarborough: Yup. And since these financial incentives are available, projects are more likely to go that route instead of using the biogas more locally.

Lindsay De May: Well that's frustrating… it sounds like most incentives for renewable natural gas are steering this technology away from some really beneficial uses such as keeping the biogas local. How can we use digesters without running into the drawbacks that we've discussed today?

Austin Scarborough: Digesters are not without their challenges. Think about everything that it takes -- the training, infrastructure, mechanics, and financial models.

Abby Bruzas: In the next episode, we will talk about some projects that we think showcase some of the best uses for digesters.

Austin Scarborough: They avoid pretty much all of the drawbacks we identified in this episode, and provide clear environmental benefits for both renewable energy and waste management.

Abby Bruzas: We hope you'll join us.

Lindsay De May: And for more great discussions about climate change, energy, and the environment, you should listen and subscribe to Vermont Law School's more regularly scheduled podcast, Hot House Earth.

Abby Bruzas: The Farm and Energy Initiative is a project of the Institute for Energy and the Environment in collaboration with the Center for Agriculture and Food Systems at Vermont Law School. We are funded by the USDA National Agricultural Library.

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Abby Bruzas: And thanks to you, for listening!

Austin Scarborough: And remember, waste is only waste if it's wasted.

*<<**Bob Spencer:** Boy, You're about as green as it gets!! >>*

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DISCLAIMER

The Farm and Energy Initiative is a project of the Institute for Energy and the Environment in collaboration with the Center for Agriculture and Food Systems at Vermont Law School, and funded by the USDA National Agricultural Library. Laws regarding the development of biogas and anaerobic digesters can change rapidly. The information presented is for educational purposes only and does not constitute legal advice.

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