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TRANSCRIPT

Energy 360°

"The Prospects for Renewable Natural Gas"

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FEATURING

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Lisa Hyland: Hello and welcome to Energy 360, a podcast from the Energy Security and Climate Change Program at CSIS. I'm your host, Lisa Hyland. This week we talk about renewable natural gas with Geoff Dietz. Geoff is the director of Federal Government Affairs at the Coalition for Renewable Natural Gas, or RNG Coalition. The RNG Coalition is a nonprofit based here in Washington DC dedicated to the sustainable advancement of renewable natural gas as a clean and domestic energy resource with a role to play in combating climate change. Geoff will talk about what RNG is and isn't, its growth potential for here in the United States, and where its use can be most beneficial. I'll turn it over to Ben now to lead the conversation.

Ben Cahill: All right, Geoffrey Dietz from the Coalition for Renewable Natural Gas. Welcome to the podcast, Geoff.

Geoff Dietz: Thanks, Ben. Really appreciate the opportunity.

Ben Cahill: I'm looking forward to talking with you about renewable natural gas. So, I think some people in our audience are probably familiar with RNG, but it might be useful to start with a basic question here today, which is, what is RNG? How's it produced, and what are the means and the different waste feedstocks used to produce renewable natural gas?

Geoff Dietz: Thanks for the question, Ben. So RNG, or renewable natural gas, is derived from the capture cleaning and conditioning of methane and other gaseous emissions from organic waste, so that's food waste, animal manure, wastewater, and other discarded organic material. So, methane that otherwise would've been admitted into the atmosphere is refined into a clean, reliable energy resource in RNG, which is functionally equivalent to conventional natural gas and can be seamlessly blended into the natural gas pipeline system.

Ben Cahill: Right. So, you often hear the terms renewable natural gas, biogas, and biomethane. I think you just pointed out the distinction between biogas and RNG, but can you just clarify, what's the difference between RNG, biogas, and biomethane? Are they the same?

Geoff Dietz: So RNG and biomethane are effectively synonymous. You'll hear them used interchangeably. I think in Europe principally you refer to it as biomethane, RNG in the United States. And then, yeah, biogas, you can consider that kind of the precursor gas to RNG, so biogas unto itself

before it can be upgraded to RNG. It can also be used for other purposes. It can be used to produce electricity or combined heat and power. But that's effectively the distinction between those three.

Ben Cahill: So, let's talk about the scale of production in the United States. How much RNG is produced in the U.S. today, and where is it produced? Can you talk about the geographical spread? And in terms of the sense of scale, how big is RNG compared with overall dry gas production in the United States? Maybe you can also just give us a sense of, what's the trend in RNG output? How's it changing?

Geoff Dietz: Right. So, in terms of RNG projects that are currently operational, we see about 115 billion cubic feet of production. There's roughly another 55 to 60 BCF under construction, and then another 115 or so BCF in planned projects. So, we're anticipating pretty significant growth just within the next two to five years. The largest projects, the landfill projects, of which we count about 90 or so, roughly a third of those are in landfill projects in Pennsylvania. Those landfill projects, I should say, are in Pennsylvania and Texas. The agricultural projects are principally located in large dairy states, so think California, Wisconsin, Idaho. And I should mention, too, the figures I cited before, that's production on an annual basis.

Given the variety and the diversity of feedstocks, there's relative geographic dispersion of RNG production across the United States. RNG production is currently approaching about 1% of total natural gas demand. I think out to 2040, 2050, that potentially approaches perhaps 10 to 15%, I would say probably in a higher growth scenario. And that production would come not just from anaerobic digestion feedstocks, which I mentioned previously, but that RNG production could also come through what are called gasification pathways, which is basically the thermochemical conversion of different feedstocks, agricultural forest residues, woody biomass energy crops that can be used to produce renewable natural gas and renewable gas more generally.

Ben Cahill: So, when we look at the trends and output of RNG, can you talk about the differences between landfill gas and RNG from agricultural systems? Is one growing faster than the other?

Geoff Dietz: Yeah, so landfill currently accounts for about 70% of RNG. Agricultural feedstock produces about 19, I think. I believe it's about 19, 20%. Certainly, we see a lot of growth on the agricultural side. The yield of landfill projects is considerably greater than agricultural projects. On the landfill side, you also see a lot of landfill gas to electricity or landfill gas to combined heat and power, both onsite and in just what are called just over the fence, what we refer to as just over the fence projects,

which are nearly geographically proximate or close by. So, a lot of different and interesting business models that are helping to build out the agricultural waste RNG project portfolio, increasingly smaller, medium-sized and smaller farms. I think those projects will become more economical with time. So that's sort of the breakdown between the two. There's also RNG from wastewater treatment plants. That's a smaller basket. It's probably about 5% or so of total RNG produced. And then from dedicated centralized food waste facilities, that's another five or 6% as well.

Ben Cahill: Okay. That's helpful background. And maybe you could also give a sense of how big this industry is outside the United States. So, I know in Europe, for example, biomethane is part of the 55-emissions reduction plan was something that came up during the REPowerEU Plan, which is the EU strategy to reduce dependence on fossil fuels and Russian imports. But give us a sense of how big this sector is outside the United States and what's the base of production in Europe and other regions.

Geoff Dietz: Sure. So according to IEA, global RNG biomethane supply was about seven BCM in 2022. IEA data has U.S. production in 2022 at two BCM, two of that seven. Our data suggests it's probably closer to three. EU countries, again according to IEA, reached four BCM last year. The remainder there comes from Asia, China, India, Thailand, as well as then Argentina and Brazil. Important to bear in mind though there, Ben, that biomethane is really only... It is a subset of the broader global biogas industry. So, it's not just that biogas can be used to be upgraded to biomethane, but that biogas can also be used for co-generation, building heating, power generation.

Now, you mentioned the EU in particular, so the EU has pretty aggressive plans for RNG, or biomethane as the Europeans refer to it, for biomethane development, deployment, and utilization. So, they have under the REPowerEU Plan calls for more than a 10x increase in biomethane production to about 35 BCM of annual production by 2030. And so, there's a biomethane industrial partnership that was stood up to help achieve that goal. And so, you see where, particularly in the European context, there's more of an, I would say, like an existential energy security value proposition that biomethane offers. So certainly, I think we'll continue to see both Europe and the U.S. drive a lot of future growth in production.

Ben Cahill: So RNG is one potential solution to a big problem, which is methane emissions. Oil and gas methane emissions are a big share of global manmade methane emissions, but the agricultural sector is huge as well. And that's due to enteric methane emissions, stuff that comes from the ruminant systems of cows and other animals, but also a lot of

it is about manure management. So, I think that's one of the reasons why there's been increased focus on RNG. But I wonder if you could just talk broadly about what role renewable natural gas has in the energy transition as a solution to the methane issue, as a solution to this broader challenge that we're facing of how to transition energy systems and lower emissions. What's the role for RNG in this big picture?

Geoff Dietz: Look, first and foremost, and this is something that me and my colleagues, I think, really try to focus on is that near-term, we see RNG as a cost-effective tool for significant methane abatement, and I think as you rightfully note, Ben, and a topic where CSIS has been focusing a lot on cross industry collaboration on methane abatement and understanding all the various sources of methane emissions that we have to deal with. But organic waste from landfills, wastewater treatment, manure management at livestock operations, those sources accounted for 23% of methane emissions in the U.S. from 1990 through 2021, compared to 29% from natural gas and petroleum systems, so there's rough parity there. And according to some studies done by one of our members, outfit called Energy Vision, which does policy and market research and analysis on anaerobic digestion and waste to energy pathways, GHG abatement from RNG would cost just $16 per ton of CO2 equivalent compared to $67 per ton for, say, capping abandoned or orphaned oil and gas wells. So that's not to say that we're in the business of picking winners and losers here, but I think in terms of discovering cost-effective and significant methane abatement potential, this is where we see RNG playing a really important role in near to medium-term here.

RNG deployment, in addition to abating methane, also generates saleable products, including fuel and compost, which can attract private investment. And we see of recent where California's LCFS program coupled with the RFS, the EPA's RFS program, has driven significant increases in methane abatement from the dairy sector just over the last five years. So that's where we tend to focus, I think, in the near term. RNG, recalling that it is functionally equivalent to conventional natural gas, can decarbonize natural gas use cases in a variety of sectors, including transportation, power generation, gas distribution. Certainly, when we think longer term about the hard-to-decarbonize industrial sectors, there's a big role to play for RNG as well.

Ben Cahill: Yeah. So, let's talk about some of the policy and the regulatory drivers for the industry. You've laid out a case for exploring different ways to think about RNG as a potential solution here, but it seems like there's a pretty big policy push as well. You mentioned the LCFS in California. Obviously, there's federal attention paid to renewable natural gas in the

Inflation Reduction Act, so maybe you can just summarize for our listeners, what are the big regulatory and policy drivers for RNG?

Geoff Dietz: Sure. LCFS program in California, certainly that compliance market has provided, I think, a huge tailwind, a huge driver for dairy-waste-derived RNG. There are also LCFS programs in Oregon and Washington. These credit-based programs are focused on reducing carbon emissions from the transportation system by providing credits, which can be traded separately, and generating additional revenue or premiums over commodity natural gas prices. There are also a number of renewable gas and clean heat standards across different states, and those can take the form of RNG procurement mandates, or they allow utilities to recover operating costs associated with RNG investment. We see mandatory, voluntary, and other enabling policies in 44 states and provinces inclusive of Canada.

At the federal level, the EPA's RFS program has provided a tailwind for RNG production and utilization as a transportation fuel. RNG qualifies as a D3, or cellulosic biofuel, as well as a D5, or advanced biofuel. There are also several USDA agriculture programs authorized by the farm bill that directly and indirectly incentivize biogas and RNG projects. And then, of course, at current, there are a number of IRA energy credit facilities, energy tax credits, that are supportive of industry. So the investment tax credit that's been utilized by wind and solar historically has been extended to biogas systems. The Section 45V tax credit for clean hydrogen offers the potential for RNG and biomass feedstock to clean hydrogen production. There's also the 45Z clean fuels production tax credit, which can be leveraged once the credit takes effect in 2025. So a variety of different state and federal policy and regulatory levers that are important to RNG development, deployment, and utilization.

Ben Cahill: Yeah, so that's a pretty big list of different tax incentives and federal and state programs. I think there's been some criticism that RNG gets too much support in the form of tax incentives. How would you respond to that?

Geoff Dietz: Yeah, I would say, look, certainly in a country like ours where we see large geologic natural gas producer, we can produce gas, we can produce geologic natural gas at very, very low prices, and it's a blessing in many ways. And so certainly RNG production, it does come at a premium, but I think it's important to recognize that RNG production is not only producing a saleable product, a saleable fuel with tremendous versatility, not just as a fuel, but also as a feedstock, but it's also resulting in tremendous methane abatement and there remains tremendous potential to abate methane from RNG deployment.

So, I think when you look out, and we look at the market right now, absent even in some instances policy and regulatory support, we see large players, large multinational companies, other large institutions which are paying premiums for RNG because they recognize the value proposition as a near-term decarbonization tool, they recognize it as a means to work toward near medium-term sustainability and ESG goals. And so, I think in the same way that we've seen policy and regulatory support help other renewable energy resources get off the ground during their early growth stages and when industry was nascent, I think RNG deserves the same support, particularly when you consider that value proposition of considerable methane abatement that RNG production and RNG project deployment offers.

Ben Cahill: Yeah. No, that's a good point. I think the difference between methane emissions from the ag sector and from landfills is that it doesn't offer the same kind of immediate economic incentives for those stakeholders as you see in oil and gas. With natural gas production, the more of your core product you can capture, the more you can sell. So, there's a clear economic incentive to do it to capture all the emissions at a landfill or a dairy farm or a big ag operation and with manure management. You need some incentives to get people to get out this problem and solve it, so that's why those federal tax incentives and subsidies exist, right?

Geoff Dietz: Absolutely. We need, I would say, source reduction of organic waste first and foremost, right? There are other manure management programs out there in states like California, which exist alongside incentives for deployment of anaerobic digesters, right? And these kinds of programs can operate in a complimentary way. We're firm believers in reduce, reuse, recycle as a best practice in terms of waste management and otherwise, again, source reduction of waste before we start to talk about what we can do with organic waste.

Ben Cahill: Okay. So, you mentioned a little bit about some of the acquisitions in the space and the corporate activity. The industry is scaling up, and it seems like some companies have looked at expanding RNG operations. So, can you just give us a breakdown of what's happened in the last year or two on that front?

Geoff Dietz: Yeah. So, a lot of great M&A activity. I think you've seen a really positive policy and regulatory outlook in the U.S. and Europe as RNG becomes increasingly relevant with regard to decarbonization and energy security. Just in the last 18 months, we've seen M&A activity north of 10, $12 billion from large asset managers purchasing RNG developers, the large energy players, historical vertically integrated oil and gas companies, Shell and BP, made acquisitions totaling $6 billion. Just last week, Enbridge acquired seven landfill-to-RNG projects from Morrow

Renewables. That's a portfolio worth about over a billion dollars. So very real and significant investment taking place. I think this generally reflects a lot of the optimism in the RNG market, the growth potential, the versatility of RNG, the ability that RNG really affords to help companies progress toward decarbonization and sustainability goals in the near to medium-term.

Ben Cahill: So, let's talk about the buyer incentives. So, there are incentives for supplying the stuff, as you mentioned. But in the same way that certified natural gas or lower emissions gas has gotten a boost because you have buyer incentives through sustainability or ESG or net-zero goals, I imagine the same is true for RNG. Can you just walk us through exactly how that works? What are the corporate targets that help increase demand for RNG, and what does that mean commercially for producers?

Geoff Dietz: So RNG can effectively support reduction of Scope 1 and 2 emissions, while also then providing additional carbon offsets through methane abatement, and then additionally non-climate environmental benefits through organic waste processing. So, I would say RNG is often considered first as a direct replacement to natural gas because it can often be fully interchangeable, but RNG can be even more impactful when substituted for more carbon-intensive fuels, such as diesel. So, there's certainly growing interest amongst multinational companies, especially manufacturers that have been working to reduce emissions and are struggling to tackle hard-to-decarbonize processes that rely on conventional natural gas.

In June, Ben, we saw one of the largest offtakes, or the largest offtake agreement in the RNG voluntary market to date. AstraZeneca, large pharmaceutical company, announced an agreement with RNG developer and RNG Coalition member Vanguard Renewables to begin producing RNG for its facilities in Delaware. And this was done pursuant to AstraZeneca's goal to achieve net-zero by 2045. The University of California's school system is the largest RNG buyer in the voluntary space. They've set a goal to secure 40% of their gas from renewable sources by 2025. I think you see a lot of gas utilities around the country are doing the same thing. In some instances, they're mandated to do so. In some cases, there are cost recovery mechanisms that allow them to do so, but in many instances, gas utilities are acquiring RNG at a significant premium. So by and large, I think companies and other institutions recognize that RNG is one of the fastest ways to work toward ESG and sustainability goals while also maintaining operational profitability.

Ben Cahill: I want to skip back to the production side for a minute and talk about scale to produce RNG. So, I went on a site visit earlier this year to a big dairy farm in Colorado. It was a huge operation. It was, I think, more than 6,000 cows, and they had built anaerobic digesters on site. We're very happy with it, but that's a big operation. So maybe you can walk us through exactly what kind of scale is required to make RNG projects economic, both from animal waste on farms and from landfill gas. It seems to me like a challenge that the industry faces is it might work for a very large municipal landfill or a place with that kind of scale, but is there a way to achieve economies of scale through different farms by building integrated systems? For example, if you've got neighboring farms, can you share infrastructure? Can they use the same large anaerobic digesters? How can you scale this up when you have dispersed stakeholders maybe with smaller operations?

Geoff Dietz: Sure. Well, no, look, I think with respect to the agway side, I think you've hit the nail on the head in terms of how the business models are kind of evolving. On landfills, yes, there are certain economies of scale there just given the gas yield that landfills offer, and that's a large part of the reason that RNG production from landfills accounts for such a significant total percentage of RNG production. On the dairy side, you're looking at multiple thousand head of cattle, usually between three and 5,000, for projects to be economical. You also have some instances where farms will source food waste to their digesters to compliment manure feedstock. But yeah, certainly there are models, Ben, around hub and smoke where you have multiple farms, geographically proximate farms, sourcing their manure to centralized digesters. Those models will result in, I think, small, medium-sized farms increasingly being able to economically deploy anaerobic digesters and RNG upgraders moving forward.

Ben Cahill: Let's talk about the constraints on this industry, both on the supply side and the demand side. So, you've given us a sense of scale relative to overall natural gas production in the U.S. today, and it seems like it's growing and there's probably a higher growth ceiling to be reached, but there's only so many landfills and so many dairy operations in the United States, right? So, what are the constraints on the supply side, and then maybe the same on the demand side? So, you've talked about some of the incentives for buyers and the credits that are available and how it fits into their overall sustainability targets. But when you think about the long-term pathway for RNG on the supply side and the demand side, how much room is there to grow? What are the real constraints?

Geoff Dietz: Yeah, so I guess maybe starting on the demand side, I think we see that policy and regulatory levers at the federal and state level will continue

to drive significant demand across all of the natural gas end uses. In the longer term, I think that's most likely the hard-to-abate segments of the economy. And it's not just, I would say, demand for RNG in the long-term as well, but also the capture and beneficial use of the biogenic CO2 byproduct of RNG production, which could, of course, be used to produce e-fuels or methanol. We also see, I think, voluntary markets, Ben, over the longer term for RNG, we'll see significant demand. I wouldn't frame it as a constraint, but perhaps a challenge to us is to advance education and broader awareness of RNG as a renewable resource and getting that message out not just to large corporate and financial institutions, but also to civil society writ large. I think some portion of the energy transition will depend on large commercial and non-commercial entities voluntarily enacting decarbonization strategies, as some already have. So, I think we intend to educate corporate leaders, not just corporate leaders, but also community civil society, about the sustainability credentials of RNG as a ready-at-hand tool to reduce Scope 1, Scope 2 emissions. I think on the demand side, we're fairly covered.

Certainly, on the supply side, look, as far as we're concerned, when we look out, certainly on the ag pathway side, we've only reached, I think, about 7% penetration on dairy farms that we believe could economically accommodate anaerobic digesters and RNG upgraders. On the swine side, hog farms were at roughly 1%. There's also pilot projects at poultry farms as well. So, I think we've got a long way to go on the agway side. There's similar growth potential at landfills as well, especially when you think about the prospects of landfill gas to electricity or landfill gas to just over-the-fence biogas projects. When you think about power purchase agreements that might be coming up on expiration, there may be opportunities to deploy further RNG upgraders to those existing landfills as well.

And then, look, longer-term when you think about food waste diversion policies that are out there, that opens up opportunities for centralized food waste projects located principally around large population centers as well. And then on top of that, Ben, that's just what we refer to as the anaerobic digestion feedstock waste to RNG pathways. There's also the gasification pathways of the wood waste, agricultural forest residues, and there's much greater potential for production through gasification when coupled with the production pathways that can be achieved through anaerobic digestion and production from landfills.

Ben Cahill: Yeah, that's interesting. Well, as you mentioned, CSIS has been doing a lot of work on cross-industry methane emissions issues and potential collaboration. And to me, one of the striking things is that we have this methane challenge in multiple industries, in oil and gas, in different

segments of agriculture and in waste, and yet, because the problems are so different, a lot of investors and NGOs and others tend to take kind of a siloed approach to one or the other. But RNG is interesting because it's kind of at the nexus, especially ag and landfill issues, and it gets at some of the economic challenges.

So, all that is to say I am really grateful to you for coming on the podcast today to talk about it. Definitely look forward to hearing what's next for RNG, but really appreciate you sharing your insights about this industry and what's next. Thanks for being with us.

Geoff Dietz: Yeah, I really appreciate it, Ben. And let me make a plug for the great work of CSIS and the work that you all are doing. I think I had mentioned the cross-industry collaboration and methane reduction, so I think it's timely, it's absolutely critical, and to my knowledge, you all have poll position on the thought leadership there. So, thanks to you all for really leading on that, and thanks for the opportunity to participate here. I really appreciate it.

Ben Cahill: Thank you for the kind words, and thanks to everyone for being with us today.

Lisa Hyland: Thanks to Geoff for joining us this week. I encourage you all to take a look at the work that RNG Coalition is doing. Their website has some really useful information to get you started. Geoff joined our recent event on cross-industry collaboration on methane reductions. If you would like to know more about our work in this area, you should check it out. There are links in our show notes. As always, you can find episodes of Energy 360 wherever you listen to podcasts and at csis.org. Thanks for listening.

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