

How to Finance a Biogas Project

Three of America's leading experts guide us through the pitfalls to profits



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Introduction

The challenges of financing biogas and biofuel projects are many and daunting for investors who are looking to take equity positions, and commercial lenders who are considering the provision of debt finance. To find out more about those challenges, and the best way to meet them, *Renewable Waste Intelligence* conducted in-depth interviews with three leading experts who are putting together the deals that are driving the American bioeconomy.

The first point that emerges from all of these interviews is the need for everyone involved in projects thoroughly to understand what they are doing. They must grasp the physical factors necessary to make money in a given location, the degree of commercial and technological risk associated with a given feedstock and the large number of city, state and federal programs that have been set up to encourage renewable energy production, each with its own qualification criteria and rulebook.

The second point is that neither the economic nor the political background is particularly favourable for bio projects at this moment. Returns are constrained by the low price of fossil fuel, and the need to compete with the powerful industries of solar and wind in the renewables space, as well as the attraction of other investments, such as social media and IT, in the wider economy. Many bio schemes do not have an attractive risk–reward profile relative to their competitors, and the industry is too fragmented to lobby for the kind of tax breaks that wind and solar have managed to obtain, and retain long after they have become established.

The third point is that, despite all of these difficulties, it really does make sense to invest in the bio industry. Nobody doubts the industry's growth prospects in the longer term, for the simple reason that something will have to be done with the US' ever growing food waste –and the methane it gives rise to. And nobody doubts the advantages that will be gained by the first movers who get to grips with the market and its commercial networks. Then there is the bewildering range of government programs, which offer great scope for creativity when putting together project finance deals, and it is possible to pull off extraordinary, inspiring, projects if you have the right plan, and the right lawyers and financiers in your corner.

In the following pages, our experts go into the nitty-gritty of financing bio projects taking into account all the commercial, environmental, technological and regulatory factors that must be considered, and they suggest where the industry will be moving next.

And if you would like to ask them for even more details, come along to our **Biogas West Coast** conference in October, where they will all be speaking.

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Biogas Financing Q&A



Mark Riedy

Mark is a partner in **Kilpatrick Townsend**, where he runs a team of 74 lawyers in the renewables practice group. He has been working on infrastructure project financing since the 1970s, and has been involved with renewable energy since 1980. Since then he has worked in more than 60 countries and lived in Asia for more than eight years. In 1979 he was general counsel for the Renewable Fuels Association, until 1985, when he set up the Clean Fuels Development Coalition, for which he is still general counsel. In 2001 he was one of the five founders of ACORE, the American Council on Renewable Energy. Earlier this year Biofuels Digest named him the most influential lawyer in the advanced bioeconomy along with John May and John Kirkwood.



John May

John is managing director of St Louis investment bank **Stern Brothers & Co**, and the head of its Renewable Energy Practice, which he founded in 2003. Stern is one of the principal players in clean tech finance. The bank's involvement in the bioeconomy began 20 years ago, when it invested in first-generation biofuels and simple anaerobic digestion (AD) deals; it has since become a leading player in the diversified bioeconomy we have today. Over that time John has developed a number of innovative ways to finance projects, and has become recognised as one of the top renewable energy bankers in America.



David March

David is managing partner at **Entropy Investment Management**. His firm is in the final stages of constructing two utility-scale AD plants. One is located in Charlotte, North Carolina, and will produce 5.2MW of electricity from about 350 tons of feedstock a day; the second plant is in Johnson, Rhode Island, and will produce 3.4MW of energy from about 270 tons a day. Both plants are designed exclusively to deal with food waste from non-household sources such as restaurants, institutions and grocery stores.

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Questions

1 *What are the challenges and opportunities for financing biogas projects in the US?*

David March: One challenge is that the US is a big, big country, so our landfill costs are inexpensive: the average landfill tipping fee is about \$29 per ton, so there isn't a whole lot of economic incentive on that side – a higher price would help a lot. Alongside that, we do not have a regulatory framework at the moment that really forces companies to do a better thing with their waste than bury it, so the vast majority of food waste in the US is sent to landfill. Take for example New York City, which now has an ordinance that if you generate food waste and there is a compost or anaerobic digestion (AD) plant within 50 miles of your location you have to use it rather than a city landfill – but it still transports municipal solid waste (MSW) to Ohio. If you're a really, really big country you can always find a hole someplace.

That being said, there are some locations in the US where regulation is becoming more supportive, as in Massachusetts, where it's fabulous. In North Carolina, for example, legislation was passed so that no more landfill permits were available a lot of areas. And many cities are being forced to take AD more seriously for the simple reason that there just isn't landfill space. The Environmental Protection Agency (EPA) is being fabulous, and we think biogas is going to grow dramatically in the US.

We're not sure the main impetus for that growth will come from preventing food from going to landfill, though. We think a lot of it will come out of renewable energy, and the simple reason is that clean power will be more widely promulgated. We see this because we work with a number of utilities, and they are extraordinarily supportive of AD because it offers baseload renewable power, and it has a multifaceted customer "touch" that they like. It allows them to interact much more directly with the customer.

So, Entropy, in addition to many other investors that we know, is very optimistic about AD.

John May: Biogas is a more complex investment choice than wind or solar. When you talk about the challenges it faces, I think people tend to overlook the fundamentals about how it's created. They tend to think that everything is as simple as putting MSW or agricultural waste into an AD and getting gas out of the other end. In fact, there's much more complexity to it. Food waste and other organics are not straightforward to deal with. The other thing that people underestimate is that it's one thing to say that we want biogas technologies that are commercial scale, but it's another to say we want the application of these technologies to make money.

Biogas is really two things: it's science and technology and then it's a business, and on the business side, I'd argue that if you look at how low gas prices are and how low electricity prices, there's not a lot of margin for a developer to pay for feedstock, or to take zero or negative cost feedstock and convert it into energy. So, from an equity return standpoint, the really

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challenging thing for biogas is that the returns that it offers – given where energy prices are on the output side – are medium and mid-level. They're more like infrastructure returns, like if you were to invest in a bridge or a toll-way or something that was very low risk. On the other hand, you're saying to equity investors: accept a low-teens return and at the same time take on a higher risk than you're being compensated for.

So, with the exception of a traditional manure AD that turns gas into electricity, I think that the absolute biggest challenge is the mismatch between the technology risk and the pricing risk associated with the inputs and outputs of biogas in relation to the equity returns available from the projects, given how depressed energy prices are right now.

Mark Riedy: The most difficult part of the renewable energy market to finance is the bioeconomy. An ethanol or an advanced biofuels plant or a chemical or bioproducts plant is extremely hard to do because they take a long time to stand up. But out of all of them, biogas will stand up the quickest, and you can scale the projects. This means they are much faster to do than other types of bio scheme.

One advantage of this is that they are more agile when it comes to taking advantage of state and federal incentives. You can take advantage of Renewable Identification Numbers* (RINs) under the Renewable Fuel Standard (RFS) program, and the Low Carbon Fuel Standard* (LCFS) program in California. And that's been a remarkable thing: biogas has dropped in and taken a lot of the D3 RINs* for cellulosic biofuel because they're smaller projects and they can be financed faster, and so they're getting the advantage of the RINs and the LCFS – and the LCFS is between 90 cents and a dollar a gallon. If you add that to a 2017 D3 RIN, it'll probably be over \$1.70. Add that to the rack price* of ethanol and then all your producer tax credits* (PTCs) for as long as they last and you've got quite a big number for the product.

2 *What kind of project offers the best returns?*

David March: Personal preference, but on the biogas field I like AD. There are three things I can do with it. I can produce electricity, or pure thermal, or I can clean it up and do pipeline. For us in the US, because of low tipping fees, everything is determined by the tax or financial incentives. If I make electricity I comply with the requirements to claim PTCs and ITCs* so that reduces my capital costs; but I do not get ITCs or IPCs if I'm producing either thermal or pipeline gas, so that's a big sway there.

Within the electricity side, in certain states, you can also earn renewable energy credits if you have a beneficial use for the material that is created alongside the electricity. So, at our Carolina plant, we'll use the thermal energy that is produced in a beneficial way by drying the digestate, so we'll actually get value from the thermal as well.

If I go directly into the pipeline, the only market there that is attractive is in the transportation fuel business, and there the way the pricing works typically is that I'll sell the gas at Henry Hub* and I'll earn RINs on top of it.

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That market right now is quite active and quite attractive but in my opinion the RIN market in general – and I hate to use the term – but it's kind of broken. I'm very hesitant to invest in the RIN market because it is so out of balance between supply and demand; you have to remember they literally set the demand a year before it happens. Any market like that is destined for some sort of reversal, or at least some kind of restructuring.

So, right now, because the legislation on the D3 RINs anticipated a lot of cellulosic ethanol being available and it isn't there, the only thing that blenders can really do for their D3 is to buy a waiver allowing them to use compressed natural gas (CNG) – so that means that the RIN prices for D3 CNG are very, very attractive. On the other hand, I have a difficult time looking forward a couple of years and determining how sustainable that is, and I can't hedge the risk. So, right now, I'm strictly an electric's guy.

John May: One type of project I'd like to see more of is gasification*. There're not a lot of examples of the successful commercial-scale deployment of gasification with certain organic feedstocks in the US, so it's hard for EPCs and individual insurance firms to point to it and say it's clearly commercial. We at Stern Brothers have been trying to push the envelope and make it clear what we need in terms of data on the performance of the technology.

Another of our goals is to combine AD with certain modular GTL (gas to liquid) technologies to create higher value products to combat the slim margin I was talking about earlier. If the oil price changes it's a totally different story, of course, but I don't think anybody's willing to make an investment right now on the equity side assuming anything other than \$40 or \$50 per barrel oil. That's as high as people are willing to go right now. When prices creep higher and people are assuming \$60 and \$70 oil, then things will change.

Mark Riedy: One thing that we're working on that I've seen nobody else doing is a business whereby we're acquiring existing power plants in the biopower space, putting them back on line with a short-term power-purchase agreement (PPA), putting in a data center next to them, letting the PPA expire, then using all the power to run the data center.

Once that's done, you can add additional power and bring in additional server farms. Each of these generally needs about 24MW so it's a wonderful business. And instead of having to give away your carbon credits and your wraps to the utilities, you can hold on to those and monetize them. You sell them, at the price that you want to sell them, to the utility, and the utility is obliged by its renewable portfolio standard to produce a certain percentage of green power. There are 35 states or so that have these now, and it means the utility has to buy the credit or they have to buy renewable energy credits* (RECs). And our biopower–data center joint venture will sell that REC to them, and that's another revenue stream.

I've just done my first scheme of this kind. It was hydro rather than biopower, but we're about to do it with four biopower projects. It's a pretty wonderful business, and we're going to do it internationally. That's one reason why I'm so focused on energy procurement. The move from fossil power to renewable power is going to create tremendous demand. And it's the

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corporate model – you’re either selling to a data center or your selling to commercial and industrial company, and this opens up a whole new area that wasn’t there five years ago.

3 *How do you mitigate risk throughout the project lifecycle?*

David March: There are really two areas to look at: the first is the choice of technology and the EPC contractor. The US does not have a long and successful history of AD operations, whereas the last time I looked, there were about 15,000 grid-connected AD plants in Europe, and they had good uptime. There’s just a lot more experience in Europe than there is in the US. So, when we were choosing the technology vendors, we went to Europe and looked for people who’ve operated plants for years.

The second think to look at is location and feedstock coverage. We like to be first in a market so I can look all around the supply base, and we like to see a very high coverage ratio – in other words, if we need x number of tons, we like to see that there are at least 10 times that available. I don’t want to be beholden to any one particular feedstock. And we like to be the first mover – if you’re first in an area where there is a lot of food processing, it’s nice, because you then get different types of waste that you can optimise. For example, in North Carolina we have a lot of poultry processing. If I’m taking standard food waste I’m going to have to dilute it because it’s 25% solid and I need to get it to 11% for my digesters. The poultry waste is 93% water but has good chemical oxygen demand* (COD) content in the remainder, and the farms have to do something positive with it. If I take poultry waste, I earn extra credits from the utility, and if I combine it with food I can get the best out of both.

Another factor with location is the presence of a lot additional infrastructure. This means, for example, not being in an area that is surrounded by farms that might have their own ADs. We saw this happen in Canada: they passed legislation that allowed farm-based ADs to accept food waste, and we found that that depressed feedstock prices.

John May: One of the things we’ve lobbied for is to get gasification as a conversion technology supported by EPC contractors in the US, and in particular to get a traditional EPC wrap for the performance of the technology. What’s holding back a lot of biogas production is that there is no consensus among contractors, or even among independent engineers, about the technology. In the UK, it’s very different: you can get technology wraps routinely. We don’t see that in the US. We see traditional alliances that are based on AD. I think that’s limiting because although AD has its pluses – it’s clearly commercial – it also has its limitation. For example, you have to combine the product with other upgrading technologies or backend technologies like GTL to get to the higher value outputs beyond electricity and gas.

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● **Mark Riedy:** We use loan guarantees and insurance. We're trying to get the best counterparties with the highest credit rating, the longest contract-terms for feedstock and offtake, well bonded construction companies and the best EPC wraps for performance and construction. That gets rid of most of the risk, especially with the insurance, but it's more expensive. The smaller the project, the lesser the risk. Anytime you've got smaller projects you're in better shape.

4 **How important are government subsidies, grants and guarantees?**

● **David March:** Because of low tipping fees everything is determined by the government's tax and financial incentives. As I said earlier, if I make electricity then I comply with the requirements for PTCs and the ITCs.

In the biogas sector, there's less competition from other investors, but on the other hand there's less availability of the other supporting financial services that you need, like tax equity* debt financing and things like that, so it becomes a little bit of a circular issue – there are fewer investors available because there's less debt available and less tax equity available.

You have to remember that someone who want to invest in renewable energy has a choice between AD, solar and wind, and the government incentives that they get. Now, solar and wind are extremely well know technologies, the risks are very positive, so you're competing against them. Often the players are strategic operators – for example, food processors who know the space very well and are doing it as a defensive maneuver, because they know that legislation is coming down and they want to support the biogas industry. But you've got to find those people, and it takes a much longer time to do it than going to the bank.

● **John May:** There a question as to whether the federal government will come in and offer tax credits for biogas. We've tried to get them extended to biogas, it has been promoted by the American Biogas Council and the Coalition for Renewable Natural Gas led by Johannes Escudero. They've tried to lobby, but I think Congress is tired of tax credits – in fact, they've been trying to sunset tax credits for wind and solar for a number of years but the lobbies are too powerful. So, even though those industries are clearly mature and do not need the credits, they are extended year after year.

The bio industry's problem is that it's too small and fragmented to have the lobbying strength to get the kind of governmental incentives it needs to grow at an accelerated rate. As a result, it's going to have to look for opportunities in individual states or individual countries outside the US. We need more companies that emerge as major brands, like T Boone Pickens' Clean Energy Fuels. There are a couple of great biogas companies that have emerged but most of the members of the Biogas Council are entrepreneurial, privately held companies.

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The most powerful lobbies are the public utilities, who are obliged by existing federal regulation to reduce carbon emissions, and they have to have wind and solar otherwise they'll never get to compliance. I think it's a complex political cocktail in terms of how you manage lowering emissions from power plants and at the same time limit the number of tax credits you give out. But the US is broke, right? We can't give out tax credits left and right.

Mark Riedy: One key factor is the availability of federal loan guarantees. Together with John May and his lawyer John Kirkwood, we've put together a way to achieve [higher risk] first commercial finance by not using bank debt. We use triple-A rated credit enhancements and, in this case, loan guarantees for project debt. We were able to use a lender so that instead of reaching in their pocket and making a loan they act as a trustee holding title to the bonds and to the project security, and in return we get low-cost financing. In fact, we get a lower cost than we'd get with a bank, and we get a longer term on it because maturities on bonds are longer than tenors on loans.

The other consideration is whether you can get a loan at all for first commercial projects. The only banks I've seen that will do a first commercial funding without a credit enhancement are BNDES, the Brazilian Development Bank, and the Chinese banks, particularly the Import-Export Bank of China. Other than those, no commercial bank would do it, so we had to be creative to come up with credit-enhanced bond financing from the project company.

The idea is to take project debt that might be triple-C and adding a triple-A-rated credit enhancement from the US Department of Agriculture (USDA), which means that we can get it up to a triple-B or single A, and then place bonds in the market and get real low cost funding. The banks love it because they don't have to reach in their pocket – they get paid to be the applicant to the USDA, and get paid to service the principal and interest for the bond holders, and then if the EPC doesn't wrap it [to cover technology risk] the USDA will take the technology risk. It means that the EPC can do the first project without going out on a limb, and for the second, third, fourth, and fifth project, the bank will offer a loan and the EPC will put up a performance guarantee and then you're off to the races, because our clients say they want to do 30 or 40-plus all around the world, either as build, own and operate schemes and or to licence. If they are the licensor then we work with the licensee.

These federal schemes are quite large. In this round I've got 10 applications in and they represent about \$7 billion of the \$13 billion available between the two Department of Energy (DOE) programs. Over at USDA we've being involved in 15 biofuel projects under the 9003 Biorefinery Assistance program, which offers up to \$250 million in loan guarantees for senior debt per project. The biogas ones are smaller and they're generally commercial, and you can get them done with individual applications through the business and industry or the USDA's 9007 Rural Energy for America Program (REAP) program.

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I can get a funding done at USDA in three to six months, maybe less if you've got everything ready to go. If you want to do a bunch of projects and have a credit line set aside, there's nothing like the DOE program, and even though you've got to pay the fees, you can look at those as pre-payments on interest. Then the money is already set aside for you and you can pull it down project by project, and you don't have to go out and chase lenders for it.

I speak at many conference on the bioeconomy and most people don't know about these programs, or they know about them but they don't know how good they are because they haven't taken the time to learn.

5 *What is the role of tax equity financing?*

David March: As I say, tax equity financing is extraordinarily difficult to get, and there are very few players in that market. And with the extension of the ITCs in wind, there's a lot of activity there, it's a lot less expensive to learn and transact on a solar or wind deal than it is on AD.

John May: Wind and solar have had the benefit in the US of federal tax credits, ITCs and PTCs, and – except for biomass-to-electricity projects – biofuels and biogas have not had the ability to monetise tax credits to get tax equity to fund projects, so they've had to go to firms like ours and then find non-recourse debt* in the bond market, and find traditional equity in the private placement equity market, which is essentially venture capital. That's a much more difficult row to hoe than simply calling up JP Morgan and saying, I have a solar project, give us tax equity. And that's the way the solar and wind industries were built.

Mark Riedy: On the fuel side you've always had a PTC, but we've never had an ITC. But we're seeing them come up now for chemicals: there are two bills in Congress, one is Senate bill S.2271 (The Renewable Chemical Act) and the other is House bill HR.3390 (Qualifying Renewable Chemical Production Act), and they would provide either a 15 cent per pound production credit or a 30% capital expenditure credit – you would have to make an irrevocable selection for one of the other.

If these bills go through and get enacted for the chemicals side, they could be extended to provide an ITC for a fuel plant. Then you could set up the same kind of tax equity structures that are used by wind and solar, which would bring non-dilutive* funding into your project. This would be a big deal.

What we do with clients is we try to compress the equity side of the capital stack; generally there's going to be a 70/30 debt-to-equity ratio at the best. The aim is then to compress the 30% so the sponsor is not putting in so much out of their own pocket. We're using new market tax credits, which run over a seven-year period and are non-dilutive, then there is tax equity, whereby money goes in upfront and the person that puts the money in takes back tax incentives, so that's tax equity financing.

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6 What is the role of regulations in developing and financing a project?

David March: When you use the term “regulation” or “regulatory environment” it has a sort of negative connotation, especially in the US. I like to take it in a slightly more positive way. I think it’s a question of accounting for externalities in order to get a clear economic picture. So, sticking food waste into a hole in the dirt is not a sustainable practice, but unless there’s some sort of cost to that, the market will actually be distorted. A free market is not an efficient market unless it captures all the costs. So, it needs to account for toxins leaching into the water system or nutrients flowing into streams and creating algae blooms that increase the cost of wastewater treatment. And, as you know, methane is 22 times worse than carbon dioxide as a greenhouse gas. The role of regulation is to account for externalities.

We also need in this country to differentiate between qualities of energy. An AD plant is going to create renewable, 24/7 baseload electricity, but I get the same price for my AD energy as if I were a solar farm. In a fair market my electricity would be worth more because it’s baseload, it’s stable. So, there’s a lot that we need to do to get more efficiency in the market. Once we do, I think AD would probably be our highest yielding resource.

John May: I think the chances are that the government in the US has done all that it’s going to do to develop biogas. You have the RFS2, which is the renewal fuels standard, which can apply to biogas, but the problem is that RFS2 is not being enforced by the EPA. This means that the gas refiners and petrochemical companies, who are the obligated parties under the RFS2, are not being penalized when they don’t buy biogas or RNG in the quantities that are dictated by law.

The argument of the American Petroleum Institute and the other lobbying organisations has been that there isn’t enough biogas or RNG, so they aren’t able to buy it in quantity and keep the demand up. So the current administrator of the EPA, Gina McCarthy, has not enforced it. The only places where you’re seeing enforcement is states like California, where the LCFS program, which applies to biogas, is being enforced. So, biogas is huge in California, because there is legislatively created and regulated demand, and I expect that that is going to migrate to places like Oregon and Washington and Colorado, which have liberal state governments and robust renewable portfolio standards. I think you’re going to see certain geographies in the US be very good for biogas, and others be less attractive.

Mark Riedy: One factor is the Supreme Court’s decision to stay [the Obama administration’s EPA Carbon Rule plan, which aims to cut carbon emissions from power plants]. If that goes ahead, and with what’s just come out of the EPA on cutting methane from landfill, there will be a lot of new ways to do things. For example, we’ve come up with a way to do 100% funding by selling allowances to utilities so they can keep their coal-fired power plants going and finance our waste-to-bioenergy project without any equity. We use the equity for working capital, and we’re on a 100% debt model where we pay the debt servicing back through the sale of allowances to the utility.

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This is driven by the requirement of federal law. It's going to take a while to stand it up because we've got to wait for the lower courts to reach a decision that will be appealed to the Supreme Court. A lot will depend on what happens at the election. If we have a Republican administration, it may not see the light of day. If it's a Democrat government, it's likely we'll see a positive result from the Supreme Court. So, two years down the road, we'll be ready to go with this new model. And we're working with states right now to put it into their state plans.

7 *How do you think the market will develop over the next five-to-10 years?*

David March: Bio is going to be widespread and it's going to be fabulously successful. There may be some pain getting there, but if you step back you have to ask, what's your alternative? You can only kick the can down the road for so long. You have to do something with food waste.

When I talk to bankers about feedstock risk, I tell them to look at it in the following way: about 44% of food is wasted just from the supply chain. We are fabulous at having the nicest looking produce in stores, and that's because we throw away everything that doesn't look nice. We have a tremendous amount of variety on the shelves but everything has a date code on it. Then a tremendous amount is wasted during preparation. That being said, can anybody think of a way to avoid or solve that problem?

With the globalization of the agricultural sector we're shipping food from all over the world. Are we going dramatically to increase local content? No, we're not, because it's too seasonal. Are people going to stop eating? Are they going dramatically to reduce the amount of food that they consume? I really doubt it. We've got an increase in population and an increase in demand. Will people decrease the amount of calories they take in? Probably not. As countries develop and people get healthier their diets change and they get more fresh food, better sources of protein, there's less packaging material, and that all increases the amount of food waste we will have. Thirdly, are people going to go back to the land and grow their own food? No. Urbanization is a universal trend, and that increases demands on the food supply chain. So, we do not look at food waste as something that has a lot of risk to it.

Now, certainly, someone could say, well what about other AD plants coming in and competing? Sure, that could happen. However, when you get down to it, the tipping fee for the feedstock will always go to the point to where you're generating the required rate of return given the risk profile of an AD plant in an area, because in my opinion the tipping fees will always go up for landfill. So, for me, I want to have the first-mover advantage. I want to be the first one in the market with the AD plant, so I'm competing against the landfill. If someone wants to build an AD plant next to me it doesn't matter, because even if I fill my plant the whole of the time, 90% of the food is still going to go to landfill. That means other AD plants will be competing with landfill too, so we're not really concerned about it.

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I don't think it will have the same drivers as Europe. That curve was more incentive-based; I think the US curve is more education and comfort based. By that I mean that we already have incentives. The economics already work. There isn't enough capital available because you have a lot of alternative investments and AD in the US, especially from the debt side, is considered to be biomass, and biomass has a bad reputation in US financial markets. Biomass was big 15 years ago when we were burning wood chips and it was going to be free fuel and all of a sudden the fuel became expensive and most people lost money. That means there's a certain prejudice against biogas, and it takes time for people to get comfortable with the technology.

That said, I think – and I could be wrong – but I think we are at the tipping point. There are our two projects and there are a couple of other larger AD plants that will be coming online in the next 12-to-24 months. Once they're operating successfully and get into the knowledge base of the market, I think its comfort level will increase and that will open up the investment community and impel a higher growth rate. When we started in solar the perception was that there was all this technical risk and we weren't sure how long the panels would last and there were all kinds of quality issues. Now it's the most established tech out there and there's a lot of low-cost capital out there, but it took time for people to become comfortable with it. AD is substantially more difficult.

John May: I think there'll be more projects, particularly coming out of landfill diversion regulations in California. I think this whole food waste movement in the US is going to be a great source of projects. I think you'll see the development of new supply chains with food waste suppliers at the top of the chain and it'll go all the ways to gas and electricity, then there'll be multiple products after that. We're trying to look for the best companies, we're trying to look for the best projects and we're trying to look for the best locations. I think the key is to combat fragmentation by putting together more than one project in a single geography and trying to do larger dollar-size finances. That's what we're trying to commit ourselves to as an investment bank – to try to put creativity and sweat equity into creating those situations.

Mark Riedy: I think it's going to continue to grow. I think if other states do what California did with the LCFS, you could have a big, big market for biogas. If Oregon and British Columbia, and maybe New York State, adopt programs as strong as California's then that would be a driver. And maybe you could use it for power use as well.

In terms of what Kilpatrick is planning, we're trying to do more of these projects internationally as we all have international experience. I would like to do as many schemes the international as the US side.

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Select glossary of terms

- **Chemical oxygen demand (COD):** In environmental chemistry, chemical oxygen demand refers to the presence of organic compounds in water. Most applications of COD tests are intended to determine the amount of organic pollutants found in surface water or wastewater, making it a measure of water quality. However, organic compounds are desirable in AD feedstocks.
- **Gasification:** The conversion of organic or fossil fuel into carbon monoxide, hydrogen and carbon dioxide. This is achieved by reacting the material at a temperature greater than 700°C without combustion, but in the presence of a controlled amount of oxygen or steam. The resulting gas mixture is called syngas, or producer gas, and is considered to be a source of renewable energy if the gasified compounds were organic.
- **Henry Hub:** A distribution hub for the US' natural gas network in Louisiana, which has lent its name to the pricing point for natural gas futures traded on the New York mercantile exchange. The name comes from the local Henry High School.
- **Investment Tax Credits (ITCs):** A one-time federal income tax credit of 30% of the capital cost of a project. This will be reduced to 10% in 2017.
- **Low Carbon Fuel Standard (LCFS):** A Californian scheme intended to reduce greenhouse gas emissions associated with transportation. They allow biofuel producers to sell their product to conventional refiners who blend it into gasoline products and so meet their requirements under the scheme. In effect, the LCFS scheme increases the demand for CNG and RNG from ADs.
- **Non-dilutive financing:** This is finance capital that does not reduce a developer or investor's ownership of a project. For example, a loan or a grant that does not affect the ownership of shares in the company.
- **Non-recourse debt:** Borrowing that is secured by collateral, usually property. If the borrower fails to repay, the lender's recovery is limited to that collateral.
- **Production Tax Credits (PTCs):** This is a federal incentive scheme intended to encourage the development of renewable energy generating capacity. Companies that generate electricity from wind, geothermal and closed-loop bioenergy are eligible for a 2.3-cent per kilowatt hour incentive for the first 10 years of operation. Open-loop biomass, landfill gas and MSW feedstock receive 1.1 cents per kWh.
- **Rack price:** What a refinery, or a biofuel plant, charges wholesalers for its product.
- **Renewable Identification Numbers (RINs):** These act as the "currency" of the EPA's Renewable Fuel Standard (RFS) program. They are created when renewable fuels are created or imported, and can be traded among market participants and "obligated parties" (that is, refiners) to meet renewable goals. D3 Renewable Identification Numbers (D3 RINs) are classed as "cellulosic biofuel", meaning it's made from plant matter. The amount of renewable fuel eligible for RINs is capped, but increases each year: in 2016 it is set at about 23 billion gallons.
- **Renewable energy credits (RECs):** These are tradable certificates that prove that 1 MWh of electricity was generated from an eligible renewable energy resource and was fed into a grid. Their use creates an additional revenue stream for green power producers.
- **Tax equity financing:** This is a combination of ITCs and accelerated depreciation benefits. Project developers, who usually don't have sufficient tax liabilities to use their tax breaks, can sell them to a third party to obtain financing for schemes.

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Speakers from *ABC, East Bay MUD, CR&R, Clean Energy Fuels, SoCalGas, PG&E* and many more will tackle the latest commercial challenges facing the US biogas industry.

Attendees include people who work for Municipalities & Government, Project Developers, EPC's, Plant Operators & Engineers, Financiers, Bioenergy Service Providers, Consultancies and relevant professionals.



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