



CLIMATE 2023

A Preview of the Year Ahead

Biofuels

Doug Berven, POET
Carrie Song, Neste
Mike Bakas, Ameresco
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Biofuels

Doug Berven is the Vice President of Corporate Affairs, Berven promotes the corporate objectives of POET, the importance of agriculture, and the benefits of biofuels domestically and internationally.

Carrie Song is the Vice President for Renewable Road Transport at Neste U.S., responsible for the company's increasing development and expansion efforts in the region.

Mike Bakas is the Executive Vice President and leads the Distributed Generation Systems at Amersco.



Summary

What does renewable gas supply look like in 2023, and what is the regulatory framework? We will discuss the EPA and the impact of Ukraine on the ecosystem as a whole. **Watch the full discussion [here](#).**

Key takeaways

- Bioethanol has been around for a few hundred years, yet it is still an emerging technology. By 2050, bioethanol will be carbon neutral, if not carbon negative.
- Electric vehicles are coming, but biofuel is an excellent solution to the energy transition. Currently, 60% of US electricity generation is from non-renewable technologies. Even though the electric vehicle (EV) does not have tailpipe emissions, more than half of the energy needed to power that EV is still generated from fossil fuels. Biofuels are available today to have an impact on our net-zero goals.
- The bioethanol industry in the United States has been subsidy-free for many years. As a result, it is the most cost-competitive fuel on the planet. But, the IRA brings the certainty for growth and innovation with other technologies, such as carbon capture and utilization, for which credits are available under the IRA.
- The IRA provides up to 15 years of investment surety for the bioethanol industry. There will always be challenges in securing enough feedstock, and demand will outstrip supply at some point. However, the biggest challenge that the Environmental Protection Agency (EPA) has right now for the short term is executing the IRA. The EPA faces a lengthy backlog in processing applications.
- Sufficient feedstocks are available today for growth but not for the complete energy transition. Therefore, we need agriculture to meet its potential by providing new markets for agricultural products. We must change the mindset that cheap grain means cheap food for everybody. That is not how this works. Cheap grain means farmers go bankrupt, which hurts supply. Farmers need healthy margins to allow agriculture to flourish.

Paul's observations

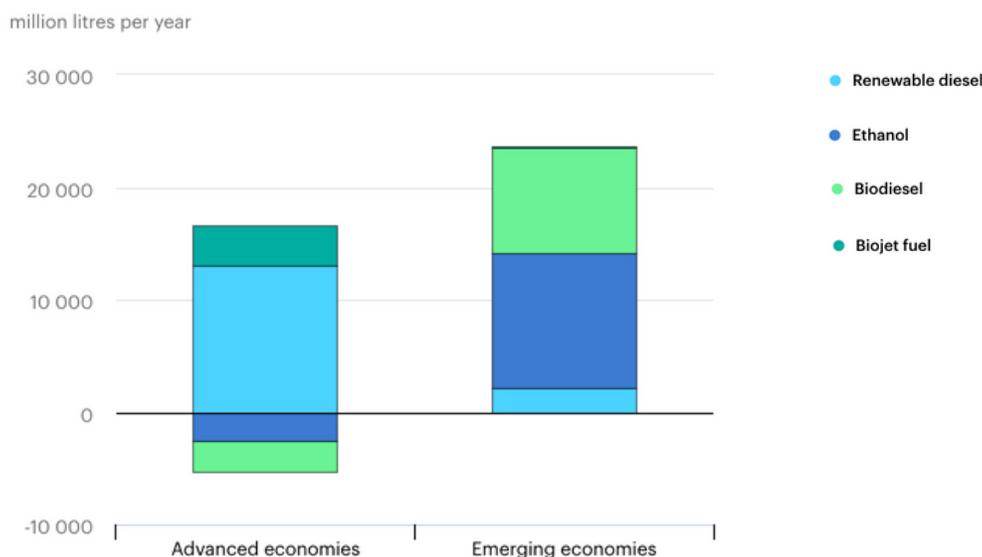
Poet is the largest Ethanol producer in the United States. The company produces three billion gallons of what they describe as the cleanest fuel globally and purchases more than 7% of the US corn crop. The response was straightforward when asked how the Inflation Reduction Act would affect their business.

“We now have fifteen years of investment certainty.”

POET plans a vast expansion of the company's infrastructure, with 33 ethanol plants across the eight mid-western states likely to grow precipitously in the years ahead. These plans have been fast-tracked, given the enormity of the investment and production tax credits that are littered throughout the IRA. POET sees the forest for the trees. While a 25bps increase in cash rates over expectations or the continuation of curve inversion can dominate public market asset performance and the media narrative, real companies are focused elsewhere. Macro analysts spend hours digesting the nuance of every word of a Jerome Powell speech, but how many could name any specific details from the Inflation Reduction Act? It will be the foundation of trillions of dollars of private-sector infrastructure investment in sectors ranging from battery technology to hydrogen. It could catalyze a European brain drain as the entrepreneurs sail west to the new Ellis Island for climate talent. The result is a Marshall Plan for Climate that will be the dominant investment narrative for global investors in 2023 and beyond.

“When the after-tax expansion cost is lowered to such an extent, ROIs are so attractive that higher interest rates become much less relevant.”

Growth in biofuel demand in advanced and emerging economies by fuel, 2022–2027



Source: International Energy Agency

Questions & Answers

POET and Bioethanol

Doug Berven:

POET is the largest biofuel producer in the world, producing about 3 billion gallons of bioethanol annually and about £15 billion of distillers. It is headquartered in Sioux Falls, South Dakota, with 33 Bioprocessing facilities in eight states, each producing around 100 million tonnes of biofuel annually. Bioethanol has been around for a few hundred years, yet it is still an emerging technology. By 2050, bioethanol will be carbon neutral, if not carbon negative. Today, bioethanol makes up 10% of the US fuel supply. It is 50% better in greenhouse gas emissions than gasoline. In addition, it is a lower-cost fuel, so it reduces the price at the pump while it reduces greenhouse gas emissions. It is a domestic fuel, which is important when considering energy security.

Electric vehicles are coming, but biofuel is an excellent solution to the energy transition.

Should we be thinking about biofuels as transitional fuels?

Mike Bakas:

Currently, 60% of our electricity generation is from non-renewable technologies. Even though the electric vehicle does not have tailpipe emissions, more than half of the energy needed to power that electric vehicle is still generated from fossil fuels. Biofuels are available today to have an impact on our net-zero goals. They will be one piece of the net-zero puzzle, but an important one. Many of the data points show that we should be able to generate, at some point in time, 20% of all our baseload fuel needs through biofuels, including baseload dispatchable generation. Biofuels are already available as a baseload dispatchable resource that can help green EVs, especially to supply the growing demand for green electricity. We can capture methane waste, process it into a usable form of energy, and then give it back to society for beneficial use. So biofuels and waste, in general, are part of the long-term circular economy.

What is holding us back from maximizing our consumption of biofuels?

Carrie Song:

The biofuel market will continue to grow with the level of climate aspiration from brand owners and customers. The industry must give waste and residues second life, contributing energy as a biofuel. The US has fuel programs that are a technology-neutral platform encouraging the adoption of different fuels, renewable fuels, and anything that will contribute to combatting climate change. Furthermore, expansion of the supply is key to upscaling the biofuel market.

On our side, Neste will produce 5.5 million tons (about 2 billion gallons) of renewable fuel in 2023. Neste has more than 10 different types of feedstock at different refineries on different continents. Wee

supply renewable fuel for aviation, road transportation, and renewable chemical recycling.

Impact of the Inflation Reduction Act (IRA) on Capex plans

Doug Berven:

The bioethanol industry in the United States has been subsidy-free for many years. As a result, it is the most cost-competitive fuel on the planet today. But, the IRA brings the certainty for growth and innovation with other technologies, such as carbon capture and utilization, for which credits are available under the IRA. It also provides incentives to reduce the carbon intensity score at existing and new plants. Under section 45Z of the IRA, production credits will be available for plants that are doing better than 50% greenhouse gas reduction compared to gasoline, scaling upwards if a plant achieves better, all the way to 100%. In this way, the IRA will affect business decisions in favor of adding technologies that will significantly reduce existing plants' carbon intensity.

POET has been moving toward these technologies, with solid fuel boilers using waste wood pallets and underutilized biomass at one plant. A pipeline from a local landfill takes the methane from underneath that landfill and pipes it into one of our bioprocessing facilities, reducing the need for natural gas there. Some of the technology requires significant investment, so the IRA's certainty is critical to installing those technologies. The IRA is a significant investment, but biofuel is taking market share from the most powerful political force on the planet, a very entrenched energy industry, and we are trying to transition from it. So, these incentives and investment credits are necessary if we want to make this transition because, without those incentives, we are just going to continue to do what we have been doing.

"The IRA is a significant investment, but biofuel is taking market share from the most powerful political force on the planet, a very entrenched energy industry, and we are trying to transition from it." – Mike Bakas

Mike Bakas:

The government is a market maker to some extent, injecting finance and creating visibility so people will invest in technology and improve efficiency. At some point, the market will take control, and the more visibility we give the market, the more investment dollars will come to this marketplace to create that critical mass. Because of investment in technology, POET and the biofuel industry are seeing their costs come down and being very competitive in the marketplace. The state of California is upping its climate goals, inspired by the IRA.

We need to drive costs down and get away from fossil fuels. We must also stop comparing green technology to fossil fuels. Fossil fuels should be a different baseline.

Carrie Song:

The California Watch group is an icon and one of the best examples of how policies can influence



different advanced technologies as energy options. About 30% to 40% of the fuel in California will be renewable diesel. This program has made a tremendous impact on the spectrum of the energy transition for the state.

The outlook for feedstock

Mike Bakas:

There will always be some challenges in securing enough feedstock, and at some point, demand will outstrip supply. However, the biggest challenge that the Environmental Protection Agency (EPA) has right now for the short term is executing the IRA. The EPA must process a lot of certifications and confirm your plan before you can sell your product. So, a flood of applications will come in to get plants certified and approved. The bottleneck will be in processing the paperwork required to leverage the IRA.

Ameresco's primary feedstock is biogas from landfills and wastewater treatment plants.

The industry has been small for many years. We have been in business for 22 years, and we have only seen a significant increase in interest in the last few years, so there are still further supply opportunities. There are only so many landfills and wastewater treatment plants of the critical size or mass suitable for these projects.

On a positive note, as electrifications pick up in the US, they will expand our addressable market in a big way, which is excellent. However, in creating that much more demand, supply will start to get short.

Doug Berven:

The potential of agriculture around the world is virtually untapped. Agriculture is key to decarbonizing the world. We have to get our resources from the land's surface rather than the earth's center. For example, the Midwest in the United States is the largest carbon sink on the planet because all the corn, soybeans, and wheat absorb carbon dioxide. That plant material can then provide power biofuel and other products. Through this process, we capture and sequester CO₂. That is what the IRA and some of these technologies and biofuels allow us to do. On the other hand, the fossil fuel industry simply takes carbon from the earth's center, processes it, and puts it in the atmosphere.

Carrie Song:

Neste will grow by 16 times next year so that we will produce 115 million gallons by 2030. We have more than 10 different types of feedstock. Ninety-two percent of the feedstock that we use are waste and residues. We also have a long list of innovation projects related to feedstock expansion and development, such as algae, forestry waste, municipal solid waste, and power to liquid. We want to increase our capability to collect used cooking oil. Neste is looking into multiple areas, developing sources of feedstock supply, our ability to collect raw materials, and our ability to process them more efficiently. Every year, Neste brings a substantial portion of its profit back into innovation.

***"The potential of agriculture around the world is virtually untapped."
– Doug Berven***

Feedstocks logistics

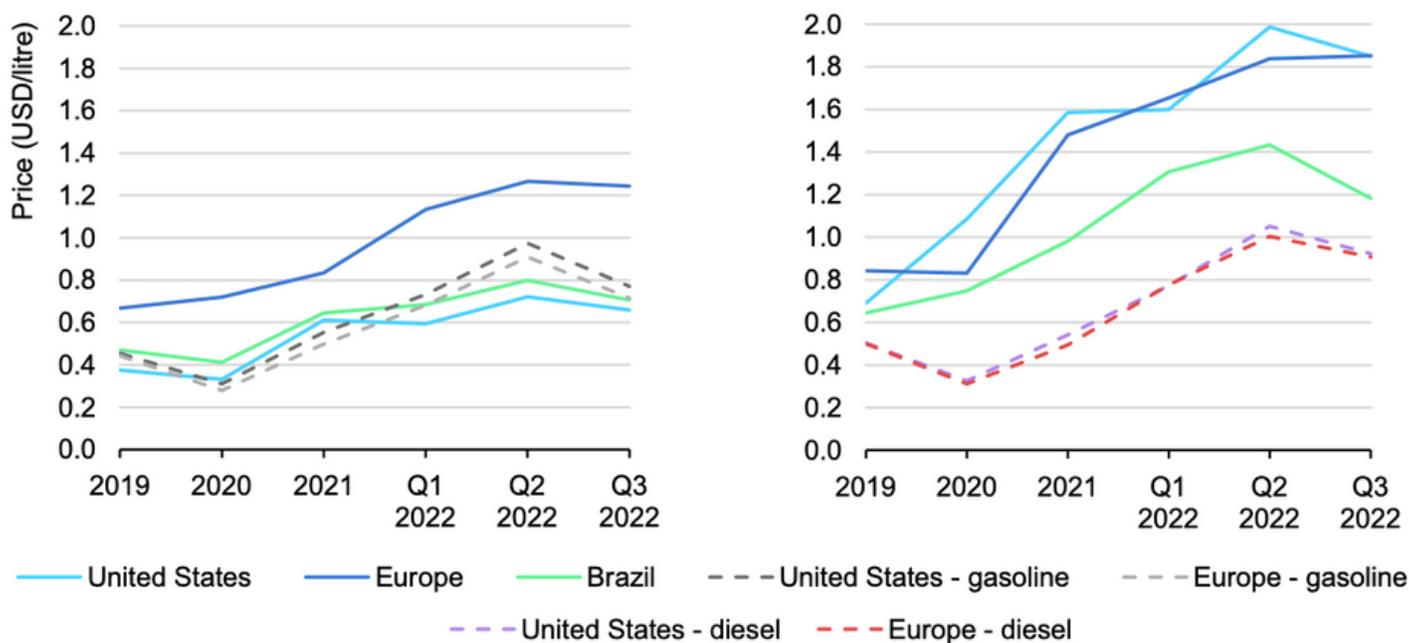
Doug Berven:

Most of our plants get their feedstocks from within a 30-mile radius of the plant, so the feedstock is very local. We do not want to have to rail in anything because adding transportation costs to biomass hurts the economics. So, all the plants that we have built have been built around just trucks coming into our facilities. Typically, 200 trucks come to a bioprocessing facility a day, and they are all local.

There is no waste when we bring corn into one of our facilities. All of the protein, fiber, corn oil, and CO₂ are used. We could always do with more corn because we are not consuming the grain—we are just transforming that grain into different things.

The industry produces enough protein to feed over 550 million people their daily dose of protein, so we are not taking away food nutrition from the world. On the contrary, we are enhancing the world of nutrition. There is no waste in the processing, and all our companies are talking about better utilizing the waste.

Ethanol and gasoline prices (left), and biodiesel and diesel prices (right), 2019-2022



Source: International Energy Agency

How does Ameresco distribute its biomethane product?

Mike Bakas:

We have some projects with direct-use pipelines to go right to the end user, and it is 100% their gas and pipe. In the future, we might send more through an interstate pipeline to transport



virtually anywhere we want and pay for the transaction. It works well to have a cluster of users so we can install a hub from which we can distribute by pipe to end users. There are government programs in the US that support green gas initiatives in the transport sector, and so most green gas goes there.

We have seen a lot of interest from industrial and commercial customers who have done a great job dealing with the electric side of the carbon footprint through solar and other technologies, but have found the thermal side more challenging.

Green hydrogen

Mike Bakas:

Each time you convert energy or transition energy, you incur losses. There is a limited supply, so we focus on markets with the strongest business cases.

We are looking at some pilot programs to explore feedstock to create green hydrogen. That will continue to evolve as technology, and government support happens because state and federal regulations and incentives affect the business development. For example, California has jumped ahead because it got in early and created programs to incentivize technology development. As a result, we can leverage the federal program and state initiatives. Many other states are now trying to replicate what California has done.

Where are you selling most of your sustainable aviation fuel?

Carrie Song:

We have customers along the West Coast and the East Coast who want to opt-in to meet their climate agenda. We also have refineries in Singapore and Europe. Our aviation customers are worldwide.

Scaling feedstock

Carrie Song:

Sufficient feedstocks are available today for growth, but not for the complete energy transition. Therefore, we need agriculture to meet its potential by providing new markets for agricultural products. We must change the mindset that cheap grain means cheap food for everybody. That is not how this works. Cheap grain means farmers go bankrupt, and we do not have enough to feed everybody. You need to have markets to support grain and agricultural prices to allow agriculture to flourish.

Look at the growth of biofuels in the US, Brazil, Europe, and all around the world: as we have



grown over the last 20 years, undernutrition has declined, partly because we have supported grain prices and we have incentivized agriculture. We do not need more land, but we need the land to meet its potential. That is what markets will do. That is what margins will do in agriculture.

The potential of agriculture is untapped because the US has overproduced grain for generations, and we have taken cheap subsidized grain. We have sent it around the world and stifled global agriculture.

Biofuels offer a catalyst for successful agriculture buying and bring a critical market to agriculture.

Thriving agriculture leads to the greatest solution to solving climate change, poverty, hunger, and disease. Still, if agriculture has no margin, it cannot meet its potential. Markets lead to margins, which leads to investment, which leads to innovation, which leads to improvement.

That applies equally to the whole world, so as we scale up sustainable aviation fuel, renewable diesel, biofuels and bioethanol, we are going to see an agricultural renaissance around the world that will help solve a lot of these problems.

Have you looked at alternative feedstocks?

Doug Berven:

Corn is our primary feedstock because it is the best material we have on the planet for biofuel production. So, not only are we not creating waste, but we are also creating markets and adding potential. So, corn is an elegant, economically viable feedstock for us. We need more grain-based ethanol worldwide to expand into cellulosic ethanol or other possibilities. We can produce about 17 billion gallons of bioethanol in the US, but we are only selling about 14 billion gallons at the moment.



Thank you for reading. Click [here](#) to access all of the sessions from Climate 2023.

Learn more about the companies featured in this interview:

- **[Ameresco](#)**
- **[Neste](#)**
- **[POET](#)**