The Year 2021
Which investments will see the light in the biofuel industry?
What is the worldwide situation of the biofuel market in end-2020?

2020 was a challenging year for the whole biofuel industry, as we have seen an unprecedented acceleration of investments in the biofuel market.

On the biofuel supply side, more than 20 companies worldwide seriously announced an investment in a HVO factory to serve the European and US markets. On the feedstock supply side, we had a crisis on the feedstock supply fueled by covid-19. In some regions, feedstock supply was 30% down compared to 2019, where biofuels demand was only 5 to 10% down. This shortage of feedstock supply was a crash-test for actors, as we fear there will not be enough feedstock to meet HVO supply in the coming years.

Why such a popularity? Countries’ mandates is above the blend wall pushing the use of alternatives of FAME and Ethanol. HVO is at this stage the only alternative to diesel biofuel FAME, and the number of diesel vehicles is so important (around 70%) in the EU, that distributors cannot bet on other alternatives non-diesel related to fulfill the mandates. Financially, HVO production makes more sense as for majors, margins are attractive, while cost per GJ remain in the same order of magnitude than FAME and UCOME costs. Finally, HVO production allows an actor to have a feet in the sustainable aviation fuel market, the bio-naphta market and the bio-LPG market, the three molecules being co-products of HVO production.

What are the risks? The main risk is about feedstock procurement, as it is not clear today how the capacity added in 2020 can secure feedstock considering the current pressure on the resources. The second risk concerns the blend wall definition. If B7 will remain the main biofuel used for diesel cars and B10/B30/B100 do not heavily penetrate the market, then HVO is safe in the short-term. In the long-term, the EU is shifting towards gasoline vehicles, meaning less diesel sales and in its wake probably less diesel biofuel sales.

2021 should probably be the year where companies are going to be down-to-earth, as investments will concretize. Players may realize that the task is harder than it seems, particularly on the operational side to secure waste-based and advanced feedstocks.

Regarding covid-19 impacts on supply and demand. Despite a complicated year, exports to the EU are increasing in the top exporters, making the EU more and more reliant on the outside. Regarding feedstocks, covid-19 barely hit exports from foreign countries to the EU. Since October 2020, most of the exporters are back to normal or better than in 2019, except China and Indonesia. Regarding diesel biofuels imports, China’s UCOME exports to the EU increased by around 300kt, increasing always more the EU’s dependance on fuels it soon won’t be able to use.

Legislation. European countries have until end-Q2 2021 to translate REDII into national schemes, however some countries have already taken the leap, particularly in West and North Europe. For instance, the German Ministry of Environment has started the process of REDII transposition with an ambitious draft of law that projects to increase the GHG reduction mandate by 22% by 2030. In the UK, a cap of 4% 1G feedstock has already been proposed decreasing to 2030. Italy, Sweden, Netherlands, Spain have as well set some guidelines for the next decade.

More to see in the following presentation!
Everywhere in the world, new HVO\textsuperscript{1} projects are projected to significantly increase by 2025, triple in the EU, six-fold in the US, and three-fold in Asia compared to 2020.

Source: Greenea Analysis
Note: 1. Includes all type of HVO for road transport projects: pure and co-processing projects

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\( \text{HVO capacity (million ton)} \)
... and so are biojet fuels, mostly HVO-based, where most of the projects will see the light in 2025
For 3 years, the EU has not been ensuring its own UCO collection to meet its UCO(ME) demand and therefore the EU has drastically increased UCO(ME) imports.

The amount of UCO collected in Europe is slowing down since 2015…

Around 60% of the UCO supply comes outside EU, around 65% of the latter from Asia.

More UCOME/HVO from Asia was imported to compensate the gap and keep the biodiesel production steady.

Source: Greenea Analysis, Custom Data, USDA

Waste-based in the EU: maturity was reached, and the surplus will rely on imports.

UCO exports to the EU-27 (2020f)

EAST ASIA
374 KT

SOUTH EAST Asia and Oceania
482 KT

LATIN AMERICA
87 KT

AFRICA
24 KT

MIDDLE EAST
133 KT

NORTH AMERICA
116 KT

EAST EUROPE + RUSSIA
120 KT

Waste-based in the EU: maturity was reached, and the surplus will rely on imports.
The exporters of yesterday may be the consumers of tomorrow, particularly the biggest exporters such as China …

Year 2019/2020

Source: Greenea Analysis, Governments websites

Note:
1. It is noticeable that most of the oil-producing - particularly from OPEP - have not implemented a biofuel mandate.

2. Turkey only has a mandate of 0.5% of biodiesel.
... and the competition is becoming fierce ...

China is flooding the EU market with UCO/UCOME and US diesel UCO-based biofuels demand grows – to satisfy the CA¹ mandate.

Most of the southeast Asian countries collect less than 30% of their UCO potential, however the UCO is locally used or locked for further local projects.

Conclusion: Less UCO and more UCOME available for European actors?

Source: IEA, Greenea Analysis

Note: 1. California 2. 2019 is more of reference year considering covid-19 crisis in 2020

Large Oil and Gas majors are taking positions to lock UCO in China and Malaysia

Malaysia is a hub for UCO consolidation area from surrounding countries

China is starting to use the UCO locally and may reduce exports in the next years

In Indonesia, the geographical constraints are limiting the share of UCO collected

UCO exports are limited in India by the government, which wish to use UCO for local mandates

The UCO collection in Europe is robust – and today the EU only relies on imports for the growing demand of UCO

The US is close to reach its limit of UCO collected and may start importing UCO – from Asia - to satisfy its local growing demand.
The EU is still dependent on foreign countries, the total accounting for 1.4mt in 2020,…

Imports to the EU-27 are growing in most UCO-collecting countries, gravity center shifted from China to Malaysia and to non-traditional exporters

EU-27 UCO imports (thousand metric ton)

- China: 113, 112, 274, 207
- USA: 118, 115
- Malaysia: 113, 273, +160
- Indonesia: 101, 115
- Russia: 62, 94
- KSA: 62, 76
- Japan: 43
- Egypt: 53
- Others: 355, 333, +22
- Total: 1,997, 1,060, 1,340, +24%, +10%

Source: Greenea Analysis, Customs HSCODE 15180085/99

Covid-19 impact barely hit exports. Most of the exporters are back to normal or better than 2019 in October 2020, except China and Indonesia

- China: -16%, +26%
- USA: +10%
- Malaysia: +105%
- Indonesia: +38%
- KSA: +15%
- Japan: -4%

Dependence on exports for the UCO is increasing every year
FAME/HVO dependance on imports exploded in the year 2020, covid-19 was a catalyst, as the EU-27 economy was not producing enough domestically

China’s UCOME increased by around 300kt and PME imports decreasing since EU government are not promoting it, and palm oil boomed

Covid-19 may have increased dependencies for diesel biofuel imports, particularly from China

Source: Greenea Analysis, Customs HSCODE 38260090
HVO prices have become more transparent in 2020 as HVO producers are increasing, despite covid-19 crisis, spreads remain constant.

Source: Greenea Analysis
Notes:
1. Since beginning September 2020, market transparency has increased.
2. UCO DDP North West Europe (USD per ton)
3. T2 FOB ARA (USD per ton)
4. T2 FOB ARA (USD per ton) North West Europe
5. Hydrotreated Esters and Fatty Acids (HEFA) Synthetic Paraffinic Kerosene North West Europe

Market more transparent with day-to-day reporting\(^1\)
Biofuel Legislations for the most biofuel-consuming EU countries

In France, the Parliament is currently discussing the draft of the 2021 budget law, which article 15 notably the ban of palm oil and soybean oil in 2021. No GHG mandate will be included in the law before 2022.

The German Ministry of Environment has started the process of REDII transposition with an ambitious draft of law that project to increase the GHG reduction mandate by 22% by 2030.

In Italy, major changes from 2023 are in the making: the ban of palm and soy oil for biofuels eligibility + the separation of the blending obligation for diesel and gasoline. A proposition to put a cap of 2.5% cap on used cooking oil was proposed by the government and to include biogas in the advanced sub-target. New advanced sub-targets have been published on March 2, 2018, for which biomethane account for 75%, the remaining 25% being covered with biofuels made from Annex IX Part A feedstocks.

Spanish authorities have drafted a Royal Decree to increase the biofuels blending obligation to 9.5% and 10% e.c in 2021 and 2022, respectively.

The focus is on a linear path with indicative levels for 2030 of 28% for petrol and 66% for diesel, with a control station in 2022”. It also confirmed its willingness implement a biojet obligation (0.8% GHG from 2021 or 2022) but delays linked to the coronavirus situation were announced. The draft of law is still not available.

It is unlikely that the Netherlands will put a cap on waste-based mandates since biofuel mandates are high.

Country examples (non-exhaustive)

<table>
<thead>
<tr>
<th>MANDATE</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>EC biodiesel</td>
<td>7.9%</td>
<td>8%</td>
<td>8%</td>
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<tr>
<td>EC biogasoline</td>
<td>8%</td>
<td>8.2%</td>
<td>8.6%</td>
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<table>
<thead>
<tr>
<th>MANDATE</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
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<tbody>
<tr>
<td>GHG</td>
<td>4%</td>
<td>6%</td>
<td>6%</td>
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<tr>
<td>Advanced</td>
<td>-</td>
<td>0.05%</td>
<td>0.10%</td>
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<thead>
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<th>MANDATE</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
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<tbody>
<tr>
<td>Biofuels</td>
<td>8%</td>
<td>9%</td>
<td>10%</td>
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<tr>
<td>Advanced</td>
<td>-</td>
<td>1%</td>
<td>1.5%</td>
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<tr>
<th>MANDATE</th>
<th>2019</th>
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<th>2021</th>
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<tbody>
<tr>
<td>Biofuels</td>
<td>7%</td>
<td>8.5%</td>
<td>9.5%</td>
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<tr>
<td>Advanced</td>
<td>-</td>
<td>0.1%</td>
<td>0.1%</td>
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<tr>
<td>GHG</td>
<td>-</td>
<td>6%</td>
<td>?</td>
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<thead>
<tr>
<th>MANDATE</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biodiesel</td>
<td>20% GHG</td>
<td>21% GHG</td>
<td>25.3% GHG</td>
</tr>
<tr>
<td>Biogasoline</td>
<td>2.6% GHG</td>
<td>4.2% GHG</td>
<td>5.6% GHG</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>MANDATE</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biofuels</td>
<td>12.5%</td>
<td>16.4%</td>
<td>17.5%</td>
</tr>
<tr>
<td>Advanced</td>
<td>0.8%</td>
<td>1%</td>
<td>1.2%</td>
</tr>
<tr>
<td>GHG</td>
<td>4%</td>
<td>6%</td>
<td>6%</td>
</tr>
</tbody>
</table>

How does this translate into demand in supply in the year 2030?
High competition on 1.5G and 2G feedstocks pushed companies to directly acquire feedstock collectors and engage in ventures – the trend is accelerating with an increasing pace

Biofuel producers and waste-based feedstocks join-ventures and acquisitions have been booming since 2018

<table>
<thead>
<tr>
<th>Buyer</th>
<th>Seller</th>
<th>Country</th>
<th>Biocomponent</th>
<th>Time</th>
<th>Type</th>
<th>Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neste</td>
<td>Alterra Energy</td>
<td>USA</td>
<td>Plastic waste liquefaction</td>
<td>Jan 2021</td>
<td>Equity</td>
<td></td>
</tr>
<tr>
<td>Gevo</td>
<td>Praj</td>
<td>India</td>
<td>Biojet</td>
<td>Q4 2020</td>
<td>Join Venture</td>
<td></td>
</tr>
<tr>
<td>Shell</td>
<td>Red Rock</td>
<td>USA</td>
<td>Biojet</td>
<td>Q4 2020</td>
<td>Join Venture</td>
<td></td>
</tr>
<tr>
<td>Neste</td>
<td>Bunge / Loders Croklaan</td>
<td>Holland</td>
<td>Storage / refinery</td>
<td>Nov 2020</td>
<td>Acquisition</td>
<td></td>
</tr>
<tr>
<td>Shell</td>
<td>World Energy</td>
<td>USA</td>
<td>Biojet</td>
<td>Q3 2020</td>
<td>Join Venture</td>
<td></td>
</tr>
<tr>
<td>Neste</td>
<td>Count Terminal</td>
<td>Holland</td>
<td>UCO</td>
<td>May 2020</td>
<td>Acquisition</td>
<td></td>
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<tr>
<td>Muenzer</td>
<td>Rotie</td>
<td>Holland</td>
<td>UCO</td>
<td>Apr 2020</td>
<td>Acquisition</td>
<td>120 kt</td>
</tr>
<tr>
<td>Neste</td>
<td>Mahoney Environmental</td>
<td>USA</td>
<td>UCO</td>
<td>Mar 2020</td>
<td>Acquisition</td>
<td></td>
</tr>
<tr>
<td>Quatra</td>
<td>Collecto Leo</td>
<td>France</td>
<td>UCO</td>
<td>Mar 2020</td>
<td>Acquisition</td>
<td>2.5k tons</td>
</tr>
<tr>
<td>JGC</td>
<td>JXTG</td>
<td>Japan</td>
<td>Biojet</td>
<td>Q1 2020</td>
<td>Partnership</td>
<td></td>
</tr>
<tr>
<td>Hain &amp; Co.</td>
<td>SK Chemical</td>
<td>Korea</td>
<td>1.5G FAME</td>
<td>Feb 2020</td>
<td>Acquisition</td>
<td>120k tons</td>
</tr>
<tr>
<td>Finco Fuel</td>
<td>Goodfuels</td>
<td>Holland</td>
<td>HVO / Biofuels Distribution</td>
<td>Jan 2020</td>
<td>Acquisition</td>
<td>-</td>
</tr>
<tr>
<td>BP</td>
<td>Bunge</td>
<td>Brazil</td>
<td>1G Ethanol</td>
<td>Dec 2019</td>
<td>Join Venture</td>
<td>-</td>
</tr>
<tr>
<td>Sunoil</td>
<td>Kampen</td>
<td>Holland</td>
<td>1.5G FAME</td>
<td>Oct 2019</td>
<td>Acquisition</td>
<td>150k tons</td>
</tr>
<tr>
<td>Verbio</td>
<td>Atlantic Biodiesel</td>
<td>Canada</td>
<td>Biodiesel 2G</td>
<td>May 2019</td>
<td>Acquisition</td>
<td>150k tons</td>
</tr>
<tr>
<td>Gunvor</td>
<td>Bionor</td>
<td>Spain</td>
<td>1.5G FAME</td>
<td>Feb 2019</td>
<td>Acquisition</td>
<td>200k tons</td>
</tr>
<tr>
<td>Quatra</td>
<td>Roti</td>
<td>Holland</td>
<td>UCO</td>
<td>Jan 2019</td>
<td>Acquisition</td>
<td>-</td>
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<tr>
<td>Greenenergy</td>
<td>Rezon Energy</td>
<td>Singapore</td>
<td>UCO</td>
<td>Sep 2018</td>
<td>Acquisition</td>
<td>150k tons</td>
</tr>
<tr>
<td>Parcom Capital</td>
<td>Simadan</td>
<td>Holland</td>
<td>Biodiesel / UCO</td>
<td>Jul 2018</td>
<td>Acquisition</td>
<td></td>
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<tr>
<td>NordEster</td>
<td>Oltosva</td>
<td>France</td>
<td>Biodiesel / UCO</td>
<td>Jul 2018</td>
<td>Acquisition</td>
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<tr>
<td>Argent Energy</td>
<td>BDA</td>
<td>Holland</td>
<td>TME</td>
<td>Jul 2018</td>
<td>Acquisition</td>
<td>120k tons</td>
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<td>Greenenergy</td>
<td>Oltbanking</td>
<td>Holland</td>
<td>1.5G FAME</td>
<td>Jul 2018</td>
<td>Acquisition</td>
<td>200k tons</td>
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<td>Neste</td>
<td>Demeter</td>
<td>Holland</td>
<td>UCO / AF</td>
<td>May 2018</td>
<td>Join Venture</td>
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<td>Neste</td>
<td>Electrawinds</td>
<td>Holland</td>
<td>Biodiesel</td>
<td>Dec 2016</td>
<td>Acquisition</td>
<td></td>
</tr>
</tbody>
</table>

Source: Press Release, Companies Websites

Biofuel producers and waste-based feedstocks join-ventures and acquisitions is becoming trendy
Regarding 2G, supply must be multiplied by five by 2030 to reach targets.

**Country examples (non-exhaustive)**

<table>
<thead>
<tr>
<th>Country</th>
<th>MANDATE</th>
<th>Biofuels</th>
<th>Advanced</th>
<th>GHG</th>
<th>Advanced</th>
<th>GHG</th>
</tr>
</thead>
<tbody>
<tr>
<td>Germany</td>
<td>2019</td>
<td>8%</td>
<td>-</td>
<td>4%</td>
<td>-</td>
<td>0.05%</td>
</tr>
<tr>
<td></td>
<td>2020</td>
<td>9%</td>
<td>-</td>
<td>6%</td>
<td>-</td>
<td>0.05%</td>
</tr>
<tr>
<td></td>
<td>2021</td>
<td>10%</td>
<td>-</td>
<td>6%</td>
<td>-</td>
<td>0.10%</td>
</tr>
</tbody>
</table>

**Biofuel consumed in the EU (PJ) from different mix of feedstocks in the annex 9A (2019)**

- Around 30% of overall
- Around 25% of overall

**Source:** Greenea Analysis

**Note:** 1. PJ = million of GJ, including macroeconomic hypotheses in energy needed in 2030 in the EU
2021: The year where HVO/UCOME players will start considering the below elements...

Elements to consider before low carbon final investment decision …

Decline of diesel and diesel biofuels in the wake
Investors will start taking more in consideration the consumption change between diesel vs gasoline fuel and the market penetration of vehicle electrics

Alternative fuels boost
Several EU States support the biogas or biomethanol for the 2G market in order to have local approaches and avoid dependence on SBE, POME, UCO

UCO quality unpredictable
Expected issues on UCO quality due to limited UCO supply, impacting UCOME production yields and increasing factories maintenance costs

Reducing trading margins
At least 3 new Trading Desks for Biofuels & Feedstocks starting in Europe & Asia making more pressure on trading margins

Talented traders out
The feedstock and biofuel trader market is limited, making it hard for new entrants to attract experienced traders

1G FAME prices up thanks to palm oil phase-out
The ban of palm oil & soybean oil starting in EU states will keep increasing pressure on the biodiesel price, the former is forecast to increase

Local legislation increase
Local legislation is not promoting HVO, rather promoting biogas, B100, hydrogen and renewable electricity

Increasing dependance for imports
Does not make sense for States to rely on feedstocks from outside the EU, as waste-based feedstock imports is now close to 70%

Threat of higher blend walls
B10, B20, B30, B100, E85 are penetrating the market making HVO demand at risk in the EU and California

Global feedstocks deposits are stretched…
Global waste-based feedstock deposit in 2030 (million ton)

<table>
<thead>
<tr>
<th>Country</th>
<th>Feedstock demand</th>
<th>Global supply</th>
<th>Ukraine supply</th>
<th>Waste-based feedstock deposits in 2030 (million ton)</th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>7.0</td>
<td>31.0</td>
<td>6.4</td>
<td>Waste-based feedstock imports is now close to 70%</td>
</tr>
<tr>
<td>India</td>
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<td>Middle East</td>
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<td>Europe</td>
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<td>USA</td>
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<td>South America</td>
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<td>RoW</td>
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<tr>
<td>Total WB</td>
<td></td>
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<tr>
<td>Advanced feedstock</td>
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<td></td>
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<tr>
<td>Feedstock to find</td>
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<td></td>
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<tr>
<td>HVO cap 2030</td>
<td></td>
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</tbody>
</table>

Source: Greenea Analysis

Will 2021 be the year of questioning government policies, often very euphoric on biofuels and renewables in general, but the market reality will always be there to put things back in place
GREENEA is a consulting firm specialized in low carbon strategy

Our Services

1. Market entry in the businesses of low carbon activities
2. Custom-tailored support for drafting low carbon strategy
3. Due-diligences for corporates, private equity and banks
4. Environmental, Social and Governance assessments
5. Energy & Resource Optimization
6. Feedstock procurement and trading risks
7. Transport, Logistics of Low Carbon Feedstocks
8. Companies resilience against climate change

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70% S&P 500 CLIENTS
100+ MISSIONS WORLDWIDE
45+ COUNTRIES WE HAVE WORKED
GREENEA, two complementary activities helping you overcome your sustainability challenges

**Pioneer in brokerage of waste-based biofuels**

- Prices
- Logistics & operations
- Negotiation
- Regulations
- Production

**Offering independent and objective analyses in low carbon strategy**

- Transformation
- Marketing & Sales
- Growth
- M&A
- Risks
GREENEA has access to industry experts along all the value chain and all regions.

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- Farmers
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- Private Equity
- Automotive Industrials
- Energy Distributors
- Biodiesel and Ethanol Producers
- Airlines
- Renewable Energy Producers
- Biomass Producers
- Transportation & Logistics
- Traders
- Biogas Producers
- Recycling Company
- Cities and Institutions
Ask anything to our core team

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