



## A Note from the Executive Director

This [CAAFI Quarterly](#) newsletter describes the CAAFI activities and events that occurred July through September 2019.

In this issue, we share industry updates, CAAFI team accomplishments, and potential jet fuel production from U.S. waste streams.

I also want to make sure you are aware of the following upcoming items:

- [ABL Next](#), 30 October – 01 November, San Francisco, CA – [volunteer opportunities available](#)
- [ASA-CSSA-SSSA Meeting](#), 10 – 13 November, San Antonio, TX
- [IATA SAF Symposium](#), 14 – 15 November, New Orleans, LA

We appreciate questions, comments, and suggestions at any time. Enjoy!

*Steve Csonka and the CAAFI Team*

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## Quick Links

⇒ Check out “[What’s New](#)” for a brief review of noteworthy SAJF news from the last quarter, including funding opportunities.

⇒ Go to “[Ask CAAFI](#)”, a segment that highlights and explains relevant topics that impact the SAF/SAJF industry.

⇒ See “[CAAFI Team Highlights](#)” for a snapshot of CAAFI work teams’ projects and progress last quarter.

⇒ Jump to “[SAF Deployment Projects](#)” for a summary of select deployment projects around the United States.

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## What’s New?

[Western Illinois University announces kickoff of IPREFER Coordinated Agriculture Project: Integrated Pennycress Research Enabling Farm and Energy Resilience](#)

[Delta announces feasibility study for a sustainable aviation fuel \(SAF\) facility in Washington State as their next sustainability effort](#)

[Avfuel supplies SAF for demonstration](#)

[Lufthansa offers carbon-offsetting opportunity to passengers](#)

[IATA resolution and seven major OEMs support SAF](#)

[LanzaTech receives significant investment](#)

[Finnair flies first SAF flights funded by customers](#)

[Delta sets sights on carbon neutral aircraft deliveries](#)

[Total starts biorefinery production in France](#)

[LanzaTech and All Nippon Airways \(ANA\) sign offtake agreement](#)

[Solar-to-Jet fuel process experimentally validated in Spain](#)

*Additional information on these news items and additional funding opportunities can be found at [caafi.org](http://caafi.org).*

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## Ask CAAFI

**Question:** What is the jet fuel production potential from waste streams in the U.S.?

**Answer:** CAAFI estimates the current jet fuel production potential from waste streams to be approximately 15.6 billion gallons a year, which would have met 59% of the 2018 U.S. demand.

Feedstocks include animal manure and wastewater sludge, fats, oils, and greases (FOGs), municipal solid waste, agriculture and forestry residues, and industrial off-gases. See the production potential from each waste feedstock in the table below:

Waste Stream	Conversion Technology	Potential Jet Fuel Production (billion gpy)
Wet Wastes	HTL	3.8
FOGs	HEFA	0.8
MSW	FT	3.1
Ag Residues	FT	6.1
Forestry Residues	FT	0.4
Industrial Gases	ATJ	1.3
<b>TOTAL</b>		<b>15.57</b>

For additional details on the production potential from waste feedstock, go to [CAAFI's Feedstock page](#) and see the working document, [U.S. Waste Feedstock Jet Fuel Production Potential](#), detailing the significant jet fuel production potential from waste feedstocks.

## CAAFI Team Highlights

### Business —

- ⇒ Continued to facilitate opportunities for airline and other end user engagement, identifying supply logistics needs and informing contract processes.
- ⇒ Continued work with several firms approaching commercialization.
- ⇒ Continued to foster expanded engagement with the Southeast Partnership for Advanced Renewables from Carinata ([SPARC](#)), and Sustainable Bioeconomy for Arid Regions ([SBAR](#)).

### Certification/Qualification —

- ⇒ ARA CHJ: ARA completed their supplemental fuel property testing and submitted a concurrent

ballot to both the ASTM subcommittee and committee at the end of August. The ballot closed September 26 and received two negative votes. Resolution of those two negative votes is being discussed with the submitters and it is hoped the negative votes will be withdrawn. If the negatives are withdrawn, the new D7566 annex for CHJ fuel will be issued before the end of the year.

- ⇒ IHI is the first fuel producer to seek ASTM approval via the D4054 Fast Track qualification provision. They have completed their Fast Track testing and will be submitting an ASTM subcommittee ballot in mid-October. They are targeting approval by next spring to support fuel usage in flights supporting the 2020 Tokyo Olympics.
- ⇒ Shell/CRI has completed both D4054 Tier 1 and 2 testing and initial referee combustor rig testing (under the ASCENT National Jet Fuel Combustion Program (NJFCP)) and will be using this data to draft their Phase 1 research report.
- ⇒ HFP-HEFA (Green Diesel): The OEMs have completed their review of the Phase 1 version of the research report, but additional investigation of the feedstock quality and composition is currently underway. Additional fit-for-purpose testing and rig testing (combustor, fuel nozzle spray, APU cold/altitude starting) are being conducted under the FAA CLEEN II R&D program per recommendations from this OEM review.
- ⇒ Virent Hydrodeoxygenation: The OEMs have completed their Step 3 review of the Synthesized Aromatic Kerosene (HDO-SAK) research report and have submitted their comments and Tier 3 and 4 test requirements to Virent. Virent is now reviewing the comments. OEM combustor rig testing has been successfully completed under the CLEEN II R&D program. An earlier change in corporate ownership had slowed the activity on this project, but it may now be back on track.
- ⇒ Swedish Biofuels and Vertimass, both with alcohol-derived pathways, have recently engaged with CAAFI and ASTM to initiate their ASTM qualification efforts.

## Sustainability —

⇒ Continued to participate in the LCA, sustainability and alternative fuels tracking work in the ICAO CAEP Fuels Task Group (FTG) and Working Group 4 (CORSIA).

## R&D —

- ⇒ Dr. Joshua Heyne (UDRI) joined the team's leadership group
- ⇒ Published the [Prescreening Guidance for Alternative Jet Fuels](#) – Josh Heyne is scheduled to present a CAAFI webinar on the topic October 17<sup>th</sup>.
- ⇒ Continued discussing engaging companies with emerging alternative jet fuel pathways.
- ⇒ Hosted two CAAFI Webinars "[CAAFI State and Regional Initiatives: Process Practices & Case Studies](#)" by CAAFI Executive Director Emeritus, Richard Altman and "[Direct Air Capture of CO<sub>2</sub> and Recycling CO<sub>2</sub> into Sustainable Aviation Fuels](#)" presented by Ellen Stechel (ASU LightWorks/ Arizona State University) and Anna Stukas (Carbon Engineering Ltd.).

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## SAF Deployment Projects

◇ Published the [Farm-to-Fly 2.0 Final Report](#) summarizing the 5+ year effort.

### ◇ Connecticut

Velocys visited the South Hartford-based Materials Innovation and Recycling Authority (MIRA) facility to evaluate its use as a brownfield jet fuel processing facility. The key issue identified is the need to establish whether the existing separation of recycling from the waste stream will allow for EPA RFS 2 approval of the waste stream for RINs.

### ◇ Vermont

The team for the anaerobic digester project to create a biocrude stream from dairy manure submitted a full proposal following DOE's issuance of a \$79 million bioenergy research and development [Funding Opportunity Announcement \(FOA\)](#). The

proposal targeted the supply chain market development topic in the FOA.

## ◇ Florida-based State and Regional Efforts

- CAAFI's engagement with the Southeast Partnership for Advanced Renewables from Carinata (SPARC) is helping set important supply chain development precedents. The National Institute of Food and Agriculture (NIFA) developed increased interest in the project and has added funding to member states. A presentation of the outcomes of SPARC's supply chain team's bottom up case studies for 8 distribution scenarios using the Fuel and Freight Transportation Optimization Tool (FTOT) was developed. The analysis demonstrated distribution costs of as much as \$50 million annually for 5,000 barrel per day processing facilities for fuel and co-products depending on delivery location. The projected costs of distribution were indicated at between 10% plus or minus 5% dependent on scenario. Plans for follow up analysis are being synthesized for inclusion in the Year 3 SPARC work plan.
- Beyond SPARC the Florida efforts focus on a new coalition, the Florida Coalition for Sustainable Agriculture, Water and Energy (FCSAWE).
- CAAFI, Auburn University, Agrisoma, and SPARC leadership are collaborating with the offices of Department of Agriculture and Industry (ADI) and Alabama Department of Economic Development and Community Affairs (ADECA) in response to a Request for Proposal (RFP) to support supply chain development in Alabama. Auburn is leading an effort using FTOT analysis capabilities to identify potential locations for fuel production facilities. Mobile, AL was identified as a viable production node as it provides a sizable shipping port and has an Airbus aircraft production facility. It is expected that CAAFI will have a contract to continue this work beginning in Q3 2019 and

extend through year-end. Four FTOT scenarios, one of which is specifically focused on aggregating supply in Alabama, will be analyzed during in the project.

- CAAFI worked with the University of South Florida (USF) and the University of Florida (UFL) to develop commercialization efforts of sustainable feedstock by leveraging quality gains as a nutrient buffer, and energy crops. CAAFI engaged and added multiple parties to the project now called the Florida Coalition for Sustainable Agriculture Water and Energy (FCSAWE). Core members include:
  - the Florida Department of Agriculture and Community Services (FDACS)
  - University of South Florida
  - University of Florida
  - Subject matter experts on beets, sorghum, pongamia, carinata, elephant grass, eucalyptus
- Following consultation with the Mote Aquarium Red Tide Institute it was agreed that the near-term focus of nutrient runoff mitigation efforts would be on runoff from Lake Okeechobee to rivers and canals feeding into the Indian River Lagoon that is contributing to cyanobacteria formation limitations. The shift in strategy resulted in the following:
  - Contact with and inclusion of the Indian River Lagoon Council in formulating the plan
  - Similar inclusion of UFL in Fort Pierce, FL (Sandra Guzman) as our specialist and FCSAWE focal in the region.
  - A modified one-page white paper developed with UFL and FCSAWE members representing the Florida Energy System Consortium (FESC)
  - Distribution of the white paper to the FL Governor's Office (Red Tide and Blue Green Algae science advisor Tom Frazer)

- GA State Rural Economic Development and CAAFI have proposed that LanzaTech pursue a USDA Value-Added Producer Grant to examine supply chain development options for ethanol supply from Georgia sources to their Freedom Pines facility. A key feedstock to be examined is sorghum for which there is a grower population in SW Georgia. Awaiting word on whether this focus is one which they will embrace.
  - Discussions with GA Agricultural Extension examined the potential for energy crop rotation between both oilseed (carinata) and sugar-based crops (sorghum) as an opportunity for Georgia.
  - Given the slow progression of these activities, CAAFI has engaged the assistance of volunteer Michael Shoemaker to assist in eliciting a response. CAAFI introduced Michael to our primary Georgia focals Valerie Thomas (GA Tech) and Chris Chammoun (GA Centers of Innovation and GA Economic Development)

#### ◇ **Additional Southeast Regional Effort**

Following DOE's issuance of \$79 million [Funding Opportunity Announcement \(FOA\)](#), CAAFI has been helping Oak Ridge National Lab (ORNL) and the University of Florida to develop a concept paper examining the use of Eucalyptus derived terpene molecules as a jet fuel blendstock. CAAFI is primarily working with ORNL to execute economic and environmental analysis. Eucalyptus has the potential to reduce nitrogen and phosphorus runoff that would aid local water quality remediation efforts. As part of the proposal, ORNL agreed to evaluate FTOT as a supplement to DOE lab models in evaluating supply chain economics and environmental performance. CAAFI's role is to inform the market transformation portion of the programs.

#### ◇ **Expanded Engagement**

Progress has been made to extend the template utilized by CAAFI to expand engagement in state and

regional development by attracting other qualified parties. Eight people that have credentials as contributing CAAFI members (e.g. retired Airline, Fed Gov and others) are invited to the initial Expanded CAAFI State and Regional Initiatives call on July 25. Specific efforts to include three of these associates (Todd Campbell in Vermont, Toby Ahrens in Maine, and Michael Shoemaker in Georgia) have begun. The webinar presented by Richard Altman resulted in conversations with the Pacific Northwest National Laboratory (PNNL) regarding Vermont based manure-to-fuel project, and a Maine-based wood-to-energy project.

*If you are aware of other scenarios that could be appropriate for a regional development effort, please let us know. For more information, see [CAAFI's State Initiatives](#) page.*

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### Special Items of Interest

- [DOE announces \\$73 million for 35 projects](#) for bioenergy research and development
- The [US Economic Development Administration](#) has **made \$587 million available for eligible applicants in communities affected by disasters in 2018 and 2019**. Applicants should propose long-term, regionally-oriented, and collaborative strategies designed to generate economic growth and resilience. EDA will continue to accept applications on a rolling basis. For more information, click [here](#).
- The [US Economic Development Administration](#) has published a [Request for Information \(RFI\)](#) notice in the Federal Register **sought public input on how the federal government can better align its economic development programs and resources in order to encourage and facilitate investments in economically distressed communities, including in qualified Opportunity Zones**. EDA recognizes that while Opportunity Zone incentives are intended to leverage private capital, economically distressed communities may not be able to rely on private capital and tax incentives alone to create the

necessary conditions for long-term sustainable economic growth. Many communities are also in need of public sector investment and technical assistance. EDA requests information and input from stakeholders who support economic development in Opportunity Zones, including state, local, and tribal officials; institutions of higher education; nonprofits, philanthropic organizations and other impact investors; economic development practitioners and other experts in relevant disciplines; and affected stakeholders in the private sector. More information is available [here](#). Comments must have been submitted by October 18.

- The [US Economic Development Administration](#) is encouraging its economic development partners to find ways to highlight Opportunity Zones in their regions in order to attract investment and encourage public-private partnerships. **EDA has created an EDA Opportunity Zones Webpage for economic development stakeholders** and others to use as a resource to help them foster job creation and attract private investment. Click [here](#) to access the EDA resource page.

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*Please check the [CAAFI website](#) on a regular basis for more detail on pending activities.*

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