



## 2020 Goals and Priorities: Building on Industry Accomplishments and Addressing Remaining Challenges

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Dear Stakeholder,

Thank you for working as a member of the Commercial Aviation Alternative Fuels Initiative (CAAIFI®) to advance the industry's pursuit of sustainable aviation fuels (SAF). This past year was another great year for industry cooperation and progress, and we are expecting more of the same in 2020!

This past year saw continuing advances for development and broadened use of SAF even as challenges to accelerate widespread SAF availability persist. Members of the CAAIFI leadership team participated in more than 60 workshops, seminars, and project discussions, both domestically and internationally, during 2019. This demonstrates expanding interest among many parties and success in our efforts to achieve awareness and collaboration. In the fourth quarter of 2019, the aviation industry approved the sixth pathway for SAF production (to be added to the ASTM International specification in the first quarter of 2020). Business and Commercial aviation and manufacturers highlighted their support for SAF with demonstrations, off-takes and deliveries. And CAAIFI continued to engage with companies interested in opportunities for additional technologies and approaches for SAF supply. You can read more about 2019 highlights and CAAIFI activities in the appended pages.

At the end of each year, the CAAIFI Leadership team prioritizes CAAIFI activities for the coming year. We base this on feedback from the CAAIFI steering group and membership, informal feedback from industry and partners, and on our own observations about challenges and needs in the marketplace. Based on this input, CAAIFI leadership will continue to work in four major areas in 2020 (as we did in 2018 and 2019), focusing on concepts in each area of activity listed below.

### CAAIFI 2020 Priorities

1. **Communicate the Value Proposition of SAF** – communicate economic, social, and environmental benefits of SAF to federal, state and local governments, regional bodies, non-governmental organizations, the private sector and the public to broaden the base of stakeholders supporting SAF
  - **Focus on communicating value proposition** to regional, state and local audiences
  - **Expand outreach** via articles, interviews, and social media
  - **Participate in outreach activities** including conferences, seminars, and virtual events
2. **Enhance the Fuel Qualification Approach** – promote a broadly supported, streamlined certification/qualification program and a more durable, higher capacity process to accelerate the addition of new fuels to the ASTM International specification
  - **Advise potential SAF producers** on the most appropriate ways to navigate fuel qualification.
  - **Strengthen ASTM D4054 Clearinghouse** by leveraging new, shared funding
  - **Facilitate the use of the D4054 Fast Track approach** for appropriate fuel candidates
  - **Facilitate new producer use of Tier Alpha and Beta prescreening**
  - **Coordinate international qualification activities** to share costs and accelerate approvals

- Evaluate learnings from the [National Jet Fuel Combustion Program \(NJFCP\)](#) that might facilitate additional improvements to the D4054 fuel qualification process
3. Align Efforts to Enable Commercial Deployment of U.S. SAF Supply – focus on SAF implementation by supporting feedstock and fuel development, fostering producer-buyer engagement leading to offtake agreements, and building on federal, state and regional supply chain efforts:
- Leverage the capabilities of the FAA's Aviation Sustainability CENTer ([ASCENT](#)) in combination with local, state and regional supply chain opportunities and efforts
  - Partner with federal agencies and advance coordination of activities for SAF development
  - Expand engagement with regional, state, and local efforts including private sector parties
  - Partner with airports in cooperation with ACI-NA, to address questions about the logistics and use of SAF, identify opportunities to monetize SAF benefits that might enhance market pull, and assess infrastructure needs for SAF usage
  - Work with business aviation to partner with corporations with ambitious corporate social responsibility goals for fuel supply development and offtake agreements
4. Implement Frameworks & Share Best Practices –provide tools, share best practices and integrate information to support communication and understanding among diverse stakeholders on the readiness of feedstocks and fuels, their potential economic, social and environmental benefits and impacts, and their feasibility with regard to supply chains, technology and economics
- Expand the use and topical content of [CAAFI Webinars](#) (formerly SOAP-Jet webinars)
  - Expand the library of [Feedstock Readiness Level \(FSRL\) Evaluations](#) available on USDA's National Agricultural Library
  - Implement a Commercial Readiness Level Framework to support fuel producer self-assessment and customer understanding of the commercialization progress
  - Use publicly available analytical tools to support supply chain development and identify additional needs (e.g. Volpe Freight & Fuel Transportation Optimization Tool (FTOT))
  - Support analyses of economic benefits and jobs impacts of SAF supply chains including analyses relevant to regional, state and local levels
  - Provide technical and commercial analysis and data to stakeholders who are working with policy makers to remove impediments to commercialization

As always, please reach out to me or any CAAFI Team Lead if you have any feedback, would like to be more involved in the initiative, or have recommendations on new types of engagement you would like us to consider. We remain open to adjusting our priorities as needs arise.

On behalf of the CAAFI Leadership Team, the CAAFI Steering Group, and all our constituents, thank you for your contributions to the industry's collective effort to commercialize SAF! I'm looking forward to sharing another great year with you in 2020!

Sincerely,



Steve Csonka  
CAAFI Executive Director

## SAF Highlights in 2019

In 2019, industry and CAAFI stakeholders continued to make significant progress on SAF. We have put together a representative (not exhaustive) list below:

- **ASTM Fuel Pathway Qualification** – Industry, government and researchers continued to jointly advance fuel qualification including one new fuel approval, a pipeline of fuel candidates under evaluation, coordination of testing through the D4054 Clearinghouse, and improvements to the process with a new Fast Track provision:
  - The aviation industry completed the evaluation and approval of SAF production via ARA's Catalytic Hydrothermolysis Jet (CHJ) pathway (to be published in January 2020 as ASTM D7566 Annex A6)
  - Successfully passed and issued D4054 Fast Track Annex for streamlined approval of candidate SAF meeting stringent criteria
  - Initiated ASTM balloting of D7566 Annex for IHI Hydrocarbon-Hydroprocessed Esters and Fatty Acids (HC-HEFA) fuel utilizing the newly approved D4054 Fast Track Annex with approval anticipated for early 2020
  - Initiated ASTM balloting of the revision to D1655 Annex A1 to accommodate the Fischer-Tropsch (FT) Co-processing pathway
  - Completed D4054 Tiers 1-2 and initial NJFCP testing of Shell Integrated Hydropyrolysis Hydroprocessed (IH<sup>2</sup>) Fuel through D4054 Clearinghouse at the University of Dayton Research Institute (UDRI) funded under ASCENT for Phase 1 ASTM Research Report (submission to OEMs expected in early 2020)
  - Completed D4054 Tier 3 combustor rig testing of fully synthetic blend of Virent (Synthesized Aromatic Kerosene (SAK) fuel and HEFA
  - Re-initiated OEM evaluation of Swedish Biofuels Alcohol to Jet-Synthetic Kerosene with Aromatics (ATJ-SKA) draft Phase 1 ASTM Research Report
  - Took initial steps to engage both Vertimass and Global BioEnergies in ASTM D4054 evaluation and review process
- **Sustainable Aviation Fuel Operational Demonstrations** – The business community demonstrated its commitment to the development and use of SAF throughout the year, commercial airlines operated flights minimizing carbon emissions, and a new solar-to-jet fuel process was validated:
  - [Van Nuys Airport became the first general aviation airport in the U.S. to offer SAF and held a SAF demonstration and communication activity.](#)
  - [Avfuel supplied SAF produced by Gevo to multiple OEM flights that transited to Geneva from Farmingdale, NY for the European Business Aviation Convention and Exhibition \(EBACE\). Avfuel supplied FBO Jackson Hole Aviation in Wyoming with 7,500 gallons of SAF for its SAF demonstration day.](#)
  - [Avfuel provided Gevo-produced SAF to business jets travelling to 2019 NBAA-BACE in Las Vegas from Salina Regional Airport \(SLN\) in Kansas.](#)
  - [United Airlines embarked on the Flight for the Planet, which they publicized as the most eco-friendly commercial flight in the history of aviation.](#)
  - [Braathens Regional Airlines, Air BP, ATR, and Neste collaborated to achieve the first ever 'Perfect Flight' in Sweden in which every element of the flight was optimized to minimize carbons emissions.](#)
  - [All Nippon Airways \(ANA\) received its latest Boeing passenger jet aircraft delivered using SAF.](#)
  - [Etihad Airways flew from Abu Dhabi to Amsterdam on SAF blend from halophytes.](#)

- [A Solar-to-Jet fuel process, which produces jet fuel from concentrated sunlight, water, and CO<sub>2</sub>, was experimentally validated in real field conditions for the first time in Spain.](#)
- **Fuel Production and Use –** We saw new production potential and expanded use of SAF as an aircraft manufacturer made their first SAF sale, new planes were delivered with SAF, new partnerships began, existing partnerships continued and new agreements were inked:
  - [Gulfstream announced its first sale of SAF.](#)
  - [Boeing began offering SAF for new plane deliveries.](#)
  - [The Mercurius biorefinery pilot plant got a green light to proceed at their Gladstone, Queensland site.](#)
  - [KLM, SkyNRG, and SHV Energy announced their investment to build Europe's first commercial-scale facility dedicated to commercial SAF production.](#)
  - [Total began biorefinery production at their facility in southeastern France.](#)
  - [LanzaTech and All Nippon Airways \(ANA\) sign SAF offtake agreement with a target delivery date of 2021.](#)
  - [Neste began supplying SAF to Lufthansa on flights departing Frankfurt, Germany. The companies have been working together on developing SAF since 2011.](#)
  - [Finnair flew two flights from San Francisco to Helsinki fueled by SAF funded entirely by customers.](#)
- **Other Announcements/Activities –** New policies were announced, U.S. DOE made significant investments, a new USDA funded Coordinated Agriculture Project (CAP) kicked off, additional sustainability initiatives were launched, the industry and the international community expressed support for SAF and CORSIA, and fuel production capacity is ramping up:
  - [Sweden proposed GHG reduction mandate for aviation fuel.](#)
  - [The Netherlands announced 100% commitment to SAF.](#)
  - [Air France announced its commitment to offset 100% of CO<sub>2</sub> emissions from domestic flights starting in January 2020.](#)
  - [UK Policy Brief pointed to alternative fuels as vital to meeting their net-zero ambition.](#)
  - [Germany proposed an increase in their aviation tax on all departing flights starting in April 2020.](#)
  - [The four finalists were announced for Canada's "The Sky's the Limit" \\$5 Million Prize Challenge.](#)
  - [U.S. DOE announced \\$79 million in funding was available for Bioenergy Research and Development projects.](#)
  - [U.S. DOE announced \\$73 Million for 35 Bioenergy R&D Projects](#)
  - [LanzaTech received a significant investment from Novo Holdings to grow their sustainable fuels and chemicals production.](#)
  - [U.S. DOE announced an additional \\$14 million investment in LanzaTech's demonstration-scale integrated biorefinery in Soperton, GA.](#)
  - [Auburn University was awarded a grant, with funds made available by U.S. DOE, for Carinata Feasibility Study.](#)
  - [Western Illinois University announced kickoff of the Coordinated Agriculture Project: Integrated Pennycress Research Enabling Farm and Energy Resilience \(IPREFER\).](#)
  - [Delta announced it invested \\$2 million to collaborate with Northwest Advanced Bio-fuels, LLC on a feasibility study of a SAF facility in Washington State as their next sustainability effort.](#)
  - [Lufthansa began offering carbon-offsetting opportunity to passengers.](#)

- [SkyNRG Launched its “Board Now” Sustainability Initiative. The program allows companies to reduce their business air travel emissions while contributing toward the development of a new SAF production facility.](#)
- [Delta set its sights on carbon neutral aircraft deliveries and announced it will take 20 carbon-neutral aircraft deliveries from Airbus’ Mobile, AL facility.](#)
- [Qantas pledged to achieve zero-net emissions by 2050.](#)
- [EasyJet became the world’s first major airline to operate net-zero carbon flights by purchasing offsets.](#)
- [British Airways also announced that it will offset carbon emissions for all of their flights within the UK.](#)
- [SpiceJet Airline committed to becoming a major user of SAF by flying 100 million passengers on flights fueled by SAF by 2030.](#)
- [IATA overwhelmingly passed a resolution calling on governments to implement CORSIA. Days later, seven major OEMs released a unified statement expressing their commitment for CORSIA in supporting the aviation sector’s larger goals.](#)
- [IATA’s Director for its Aviation Environment Division addressed attempts to discredit CORSIA and SAF](#)
- [Neste opened their Global Hub for SAF business in the Netherlands. To meet increasing global SAF demand, Neste has ramped up their capacity to produce SAF to almost 36 million gallons annually and expect to be able to produce more than 350 million gallons annually by 2022.](#)
- [Expander Energy announced plans to build Canada’s first commercial demonstration biomass/gas to liquids \(BGTL\) facility in the Slave Lake area of Alberta.](#)

## CAAFI Activities in 2019

In 2019, the [leadership of the CAAFI R&D Team](#) expanded with the addition of Dr. Joshua Heyne from the University of Dayton as a co-chair joining Dr. Gurhan Andac (GE), Dr. Stephen Kramer (Pratt & Whitney), and Dr. Michael Lakeman (Boeing).

CAAFI Tools and Resources continued to be developed and applied by the community. This included the release of [Prescreening Guidance for Alternative Jet Fuels](#). In addition, the Volpe Center released the first public version of the [Freight and Fuel Transportation Optimization Tool \(FTOT\)](#) with FAA support.

CAAFI supported several SAF deployment projects in 2019. CAAFI engaged with three USDA NIFA AFRI Coordinated Agriculture Projects (CAP), including the [Southeast Partnership for Advanced Renewables from Carinata \(SPARC\)](#), working on the commercialization of the oilseed carinata, [Sustainable Bioeconomy for Arid Regions \(SBAR\)](#), working on the commercialization of guayule and guar, and [Integrated Pennyroyal Research Enabling Farm & Energy Resilience \(IPREFER\)](#), working on the commercialization of pennycress. CAAFI also completed the Farm-to-Fly 2.0 (F2F2) public-private-partnership and published the [F2F2 Final Report](#) summarizing activities and outcomes from the 6-year period of activity. CAAFI’s Executive Director Emeritus, Rich Altman, continued to lead [CAAFI’s State and Regional Initiatives on the East Coast](#) in Connecticut, Florida, Vermont and the Southeastern U.S., while activities in Hawaii also continued.

Seven [CAAFI Webinars](#) introduced CAAFI stakeholders to key activities and provided a forum for information sharing and member learning:

- [IPREFER: New Cash Crop for Aviation Fuel by Winthrop Phippen \(IPREFER\)](#)

- *CoverCress Inc.: Adding Farmer Revenue by Providing the 1<sup>st</sup> Low Carbon Intensity Cash Cover Crop on Unused Land Over Winter* by Cris Handel (CoverCress Inc.)
- *Forest System Health: Evaluating Trade-offs for Water, Fire, Biofuels, and Fish* by Mark Wigmosta (Pacific Northwest National Laboratory)
- *Low-Cost, Low-Volume Prescreening of Novel SAF* by Joshua Heyne
- *CAAFI State and Regional Initiatives: Process Practices, Case Studies* by Richard Altman (CAAFI Executive Director Emeritus)
- *Direct Air Capture of CO<sub>2</sub> and Recycling CO<sub>2</sub> into SAF* by Anna Stukas (Carbon Engineering) and Ellen Stechel (ASU LightWorks / Arizona State University)
- *Harmonized Stochastic Techno-Economic Assessment and policy Analysis for Alternative Fuels* by Juju (Zhishen) Wang (Massachusetts Institute of Technology)

CAAFI assisted IATA in planning and executing its annual [Alternative Fuel Symposium](#) in New Orleans following the fall IATA Fuel Forum meeting in November 2019. This annual activity provides a platform for industry professionals worldwide, targeting airlines and producers, to interact and find out about the latest progress and insights from across the world of SAF development and commercialization. The next meeting is being considered for May of 2020.

CAAFI assisted Biofuels Digest in planning and executing SAF Panels during the Advanced Bioeconomy Leadership Conference (ABLC) and ABLC Next in Washington, DC and San Francisco, respectively. These conferences provide a platform for bioindustry professionals worldwide to come together to learn about the latest progress and insights into the bioeconomy. The next ABLC will be in Washington, DC on March 25-27, 2020, and CAAFI will again coordinate an SAF Panel.

CAAFI assisted the Biotechnology Innovation Organization (BIO) in coordinating an SAF Panel during the BIO World Congress in Des Moines, IA on July 8-11, 2019. This conference as well as the BIO International Convention are very well attended, providing a world-stage for global bioindustry professionals to interact and find out about recent advancements in the bioeconomy. The next BIO International Convention (with +15,000 expected attendees) will be in San Diego, CA on June 8-11, 2020.

## 2020 Events of Interest

The CAAFI Team Leads will be supporting the following events of interest in 2020. Please consider joining us!

[ABLC2020](#), March 25-27, Washington, DC

[GARDN Presents SAF Talk](#), May 12-13, Montreal, QC

IATA Sustainable Aviation Fuel Symposium, May 21-22 (tbc), Berlin, Germany

[BIO International Convention](#), June 8-11, San Diego, CA

[IATA Global Sustainable Aviation Summit](#), September 29-30, Geneva, Switzerland

[ABLC Next](#), October 29-30 (tbc), San Francisco, CA

Of special note is the GARDN SAF Talk, an inaugural event intended to convene SAF-interested parties in Canada and North America. In order not to overload the SAF industry with conferences this year, CAAFI has coordinated our effort to alternate our CAAFI Biennial General Meeting (CBGM) with this Canadian meeting in the second quarter of each year. The next CBGM meeting is planned for the May/June timeframe of 2021. In the meantime we will assist our Canadian friends with their event in Montreal in

2020. Stay tuned for more information on these and additional events through [www.caafi.org](http://www.caafi.org) and the CAAFI Quarterly newsletters.