The CAAFI Quarterly

Q4 2017

A Note from the Executive Director

This CAAFI Quarterly newsletter describes the CAAFI activities and events that occurred October through December 2017.

In this issue, we introduce our new Assistant Director, Chris Tindal. Please join me in welcoming Chris to the team. He can be reached via email at Chris.Tindal@caafi.org.

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

- Carinata Biomaterials Summit, February 19 – 20, Panama City Beach, FL
- Aviation Noise and Emissions Symposium 2018, February 25 -27, Long Beach, CA
- ABLC2018, February 28 – March 2, Washington, DC
- CAAFI's General Meeting, December 4-6, Washington, DC

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

Steve Csonka and the CAAFI Team

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 new segment that highlights and explains relevant topics that impact the SAJF industry, to read about feedstocks on CAAFI's radar.

⇒ See "CAAFI Team Highlights" for a snapshot of CAAFI work teams' projects and progress last quarter.

⇒ Jump to "SAJF Deployment Projects" for a summary of select deployment projects around the United States.

What's New?

Red Rock Biofuels defined their financing approach for their first commercial-scale woody biomass-to-fuel biorefinery. The facility near Lakeview, Oregon is anticipated to go online in 2019 with a capacity of 16 million gallons of fuel per year.

Hainan Airlines conducted first Chinese transoceanic flight powered by biofuel in November from Beijing to Chicago. The fuel was supplied by China Petroleum and Chemical Corp and was comprised of 15% hydroprocessed waste cooking oil.

Agrisoma and Qantas Airways have partnered to establish a commercial alternative jet fuel (AJF) supply chain in Australia. Agrisoma aims to eventually grow the crop on nearly 1 million acres in the country and produce more than 50 million gallons per year to replace 50 percent of the airline's annual fuel needs.

November 8th was "Fly Green Day" at Chicago's O'Hare International Airport (ORD). Eight commercial airlines (Lufthansa, United, Etihad, Cathay Pacific, Emirates, Japan Airlines, Korean Air, and Atlas) flew out of ORD using Gevo's alcohol-to-jet fuel (ATJ) derived from renewable isobutanol.

Fulcrum Bioenergy closed financing for their first commercial scale MSW-to-fuels biorefinery. The Sierra Biofuels Plant near Reno, Nevada is expected to go online in the second half of 2018 with a capacity to produce 11 million gallons of biocrude per year.

SG Preston and Qantas announced that SG Preston will begin supplying Qantas with eight million gallons of SAJF per year over ten years, starting in 2020. The fuel will be used for Qantas flights to Australia departing from Los Angeles Airport (LAX) as a 50/50 blend of non-edible plant oil-based SAJF and petroleum-based jet fuel.

Neste announced a new partnership with Geneva International Airport to introduce sustainable alternative jet fuel (SAJF) for all aircraft operations.

The airport has set a sustainability target for at least one percent of annual jet fuel consumption to be renewable-based beginning in late 2018, adding itself to the growing list of "biofuels enabled" airports that can distribute SAJF to any airline at the airport.

Gevo announced it will supply its ATJ from its plant in Texas - using isobutanol produced at its Minnesota plant - to Virgin Australia for flight departing Brisbane Airport.

Masdar announced its Seawater Energy and Agriculture System project had a successful first harvest of salicornia, an AJF feedstock. The feedstock is being cultivated in the UAE using saltwater and desert land alongside seafood to contribute to the country's food and fuel security.

Additional information on these news items and additional funding opportunities can be found at caafi.org.

Get to Know Chris Tindal, CAAFI's New Assistant Director

What is your role with CAAFI?

My job title is Assistant Director of CAAFI. The job description is to assist the Office of the Executive Director and to help manage the coalition of CAAFI stakeholders and provide leadership and strategic guidance to CAAFI's Work Teams, Federal government interagency initiatives, State and Regional programs, and International initiatives consistent with CAAFI priorities. In reality, looking at the breadth and depth of the work of the CAAFI team, and the many opportunities in which they are already engaged, or those they plan to add, I expect my role to be robust and fulfilling – supporting, leading, initiating.

What is your background and how does your experience relate to SAJF?

In April 2017, I retired as the Director for Operational Energy underneath the Deputy Assistant Secretary of Navy for Energy, where I was in charge of setting energy policy and direction for the Department of the Navy, and promoting the adoption of alternative fuels. I was the Navy lead for the tri-agency (USDA/DOE/DON) Alternative Fuels Initiative which utilized long-standing programs like the Defense Production Act to help launch the advanced biofuels industry.

Being the leader of the Great Green Fleet effort was my biggest 'claim to fame'. The U.S. Navy acquired and used 77 million gallons of F-76 alternative fuel blend for their ships in the Great Green Fleet deployment in 2016. The good news is that since I left, the Navy has continued purchasing alternative fuels for their fleet. Since I retired, I have continued to engage in several U.S. and international development and evaluation activities associated with alternative fuels.

What led you to become Assistant Director of CAAFI?

When I was thinking about my retirement from the Navy, I knew that I wanted to stay involved in the bioenergy and alternative fuels space. The CAAFI team always did a good job in collaborating with their public partners, including the Navy. I knew that Rich Altman was ratcheting back in his role as Executive Director Emeritus, and CAAFI was continuing to expand their engagement, and I thought that CAAFI might need some additional experienced help. I contacted Steve and Nate about how I could possibly fit in to the organization, and they mentioned that they were thinking of establishing the role of Assistant Director. I told them that I would apply for the position if they established it, and here we are today.

What are your long-term goals for your work with CAAFI?

Honestly, I want to fulfill the CAAFI responsibility, such that the public-private partnership is no longer necessary. Like the rest of the CAAFI team acknowledges, we want to work ourselves out of a job! Obviously, in that scenario, it means that we have full global acceptance of alternative fuels and that there are numerous full-functioning biorefineries supplying alternative fuels at cost competitive rates throughout the world, and that

such biorefineries are replicating commercially. We have a lot of work to do to make this vision a reality, but we are on the right track, and are well on our way to achieving success.

Within your CAAFI role what are you focused on in the next 12 months?

I want CAAFI to help establish a new biorefinery somewhere in the world that is not currently in the works. I want to facilitate bringing all the right entities together in the biofuels value chain so that success is inevitable. Steve also wants me working on a couple of strategic initiatives to dispel misconceptions around the use of SAJF and step up engagement with airports in order to facilitate acceptance of SAJF more broadly.

What opportunities do you see for new/different/additional engagement with CAAFI Stakeholders?

I feel that there are many opportunities at the state and regional level with the development of various feedstocks that can be used for alternative fuels. CAAFI can and does assist stakeholders in getting connected with the right people to develop feedstock pathways. I also feel like we can do a better job of leveraging similar interests of other public and private entities who have publicly declared their sustainability or corporate responsibility goals of greater ambition.

What do you feel is the single most compelling need for SAJF deployment?

Achieving cost-competitiveness with petroleum-based jet fuel! This will take time and effort, allowing feedstocks, supply-chains, and producers to realize improvements in pricing due to learning-curve and scale. In the near term, in order to allow progression down those curves, industry needs stable policies of sufficient duration to incentivize businesses to move forward with learning.

What is your view on the current progress of SAJF commercialization?

With five approved ASTM pathways, we have certainly opened the door so that companies can begin the process of putting together business plans for commercialization. When more pathways are approved, there will be more companies stepping up to fill the increasing demand. Although there could be more incentives to start a biorefinery, there are entities that are taking the risk to stand up and get going. From my perspective, the future looks promising!

What do you feel are the most important milestones the industry must achieve in the next 5 years?

We need more commercial success examples and their commensurate technology demonstrations, and there are a few of those events in development. Additionally, the industry could really benefit from long-term, unchanging policies to properly stabilize the financial cases for establishing biorefineries. Further, with strong markets for SAJF, companies can initiate long term, stable feedstock contracting, in-turn sending tangible market signals to additional producers such that feedstock supply will expand, enabling higher levels of SAJF production.

What other interests do you have within the industry?

I was fortunate enough to be appointed as an Adjunct Professor on the faculty of the Queensland University of Technology (QUT) in Brisbane, Queensland. In that role, I assist in exploring research and development opportunities for QUT, as well as investigating potential opportunities to establish biorefineries in the State of Queensland.

I am also a member of the Board of Directors for Advanced Biofuels USA, a nonprofit educational organization that advocates for the adoption of advanced biofuels as an energy security, military flexibility, economic development and climate change mitigation/pollution control solution. Advanced Biofuels USA encourages public understanding, acceptance, and use of advanced

biofuels by promoting research, development and improvement of advanced biofuels technologies.

What are your interests away from work in the industry?

I am an enthusiastic believer in 100% sustainable alternative energy on the water – I am an avid sailor. The best philosophy about sailing is not to own a sailboat, but have plenty of friends that do.

I also like to travel, swim, run, and play tennis.

CAAFI Team Highlights

Business —

⇒ Continued to expand work with prospective alternative fuel producers and airlines to facilitate opportunities for airline and other end user engagement, identifying supply logistics needs and informing contract processes.

⇒ CAAFI leadership continue to work with several firms approaching commercialization, including SG Preston, Shell, ARA (and several of its licensees), NuFuels, LanzaTech, and others.

Certification/Qualification —

⇒ ATJ Ethanol: LanzaTech's proposed D7566 Annex A5 revision to add ethanol as a feedstock successfully passed the subcommittee ballot in December and will now advance to a committee level ballot in February. If the ballot progresses without any negatives, the new Annex A5 with ethanol will be issued in April.

⇒ HFP-HEFA (Green Diesel): The OEMs have completed their review of the Phase 1 version of the research report. The submitted comments require additional fit-for-purpose testing and rig testing (combustor, fuel nozzle spray, APU cold/altitude starting). There were also several comments regarding the maximum blend percentage. The FAA will collaborate with the OEMs to conduct the required rig testing under the CLEEN 2 R & D program. With expedited testing, approval is still possible in 2018.

⇒ ARA CHJ: ARA is working to update their research report with the results from the U.S. Navy engine test.

⇒ Refinery Co-processing: The second ballot failed at the ASTM D02 committee level due to negatives from the bio-diesel industry. The proposed co-processing language in ASTM to the negative comments and a new ballot will be submitted this spring.

⇒ The Virent Hydrodeoxygenation Synthesized Aromatic Kerosene (HDO-SAK) research report will be submitted to the OEMs for their Step 3 initial review in January. This review will determine if any additional testing is required prior to balloting an annex for this fuel.

Sustainability —

⇒ Worked to develop new content for caafi.org – stay tuned for new content to be released!

⇒ Continued to participate in the ICAO CAEP AFTF.

R&D —

⇒ Continued to engage companies with emerging alternative jet fuel pathways.

⇒ Posted the latest white paper, Transportation Challenges Associated with Alternative Jet Fuel Distribution.

⇒ Hosted two SOAP-Jet webinars on October 13th Dr. Kimberly Ogden and Dr. David Wright presented, Introducing New USDA NIFA AFRI CAP Grant Awardees Developing Regional AJF Supply Chains and on December 8th Dr. Mike Wolcott presented, An Overview of the FAA-funded Aviation Sustainability Center (ASCENT).

SAJF Deployment Projects

◊ **Southwest Virginia –**

- Awaiting decision on the full regional BRDI proposal submitted in September 2017. Action is expected during the first quarter of 2018.
- Efforts initiated by the Commonwealth Center for Advanced Logistics Systems (CCALS) and Center for Natural Capital on behalf of Farm-to-Fly expanded beyond the pending Appalachian Regional Commission (ARC) planning grants and BRDI grant

application that were submitted in the 3rd quarter are in process.

- CCALS is leading a follow-up effort to the 2015 VA Center for Innovative Technology (CIT) grant, which examined multiple feedstock options, to further develop the opportunity for establishing a wood-to-energy site. This will complement the previously reported BRDI and ARC efforts.

- The Center for Natural Capital is partnering with the University of Tennessee-Knoxville to develop a regional Forest Service Wood Innovation grant proposal focusing on co-product production from low technology and feedstock readiness pathways to establish an investment strategy.

◊ **South Florida Farm-to-Fly –**

- The Rural Business Development Grant (RBDG) that was completed during the third quarter of 2017 generated extensive interest throughout the region that have translated into two potential follow-up activities.
  - 1) Discussions are underway with St. Lucie County to encourage the scale up efforts of the Rural Business Development Grant (RBDG) that was completed in the 3rd quarter. While this follow-up effort initially intended to pursue a USDA VAPG that is now not likely. However, given the potential for private investment potential with St. Lucie support, this is not considered a liability.
  - 2) The sale of meal and sugar to commercial processors is being pursued in parallel with a private firm and alternative citrus producer. The verdict on whether a 2018 scale up test can come together using an already committed beet source in FL may come in Q1 2018.

◊ **North Florida Coordinated Agricultural Project (CAP) Grant –**

- Dialogue was initiated with Georgia's Centers of Innovation regarding developing a plan for a carinata feedstock facility specific to ARA's process that is projected as having maximum potential in Valdosta, GA.
- Identified Alabama Department of Economic and Community Affairs (ADECA) and Alabama Clean Fuels as entry point to a state initiative in Alabama. AL overlaps with ARC's area of interest as an opportunity for development in AL.
- Began detailed definition of base data requirements and the acquisition of resources to execute Techno-Economic Analysis (TEA) adapting work done by ASCENT for analyzing supply chains using the ARA process in other geographic locations.
- A proposal was made to describe progress of supply chain development efforts at the Feb 19-20 Carinata Summit meeting in Panama City, FL.

◊ **Vermont Farm-to-Fly –**

- Produced work statements for completion at the end of March 2018. A draft of that work outcome including commercial plans for fuel, fertilizer, feed and potable drinking water product opportunities in addition to fuel options identified in the Rural Business Enterprise Grant provide a basis for resilient product outcomes.
- As a means to expand opportunities on the co-product side, an alliance was formed with former technical advisor to Agriculture Secretary Vilsack, Todd Campbell. Todd is working with CAAFI under the VAPG to develop interactions with the dairy community to differentiate the GSR granular fertilizer co-product from other candidates currently being commercialized.

◊ **Connecticut Farm-to-Fly –**

- CT announced a $280 million proposal to restore a waste-to-energy plant in Hartford has been met with a negative response from the city. According to press releases, there are no offsetting job creation opportunities from the adopted plan.
- It has been proposed that starting in the first quarter of 2018 the CAAFI and the Connecticut Center for Advanced Technology will recirculate the findings from the RBEG projects showing favorable outcomes when fuel and co-products are added to the facility.

◊ **Minnesota –**

- A group of significant corporations associated with food production and farming have been collaborating with the Great Plains Institute to explore and foster the development of winter-cover cash crops. CAAFI will continue working with this group to explore potential funding scenarios for a program of R&D that could accelerate their development.

◊ **Use of Analytical Tools from ASCENT, Volpe and State Initiative Partners as Best Practices**

- A concerted effort was made during the period to introduce the following three analytical tools emerging from CAAFI's partners' efforts to support state project assessments:
    - TEA template produced by ASCENT is targeted for adaption to other deployment opportunities following publication of initial results.
    - Implementing Volpe's FTOT model to optimize collection, deployment, economic and environmental benefits has been proposed.
    - University of Virginia-Arlington / Nation Science Foundation's systems resiliency analysis was similarly proposed for use in multiple locations.

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.

Please check the CAAFI website on a regular basis for more detail on pending activities.

Email peter.herzig@dot.gov with any ideas for CAAFI Quarterly items of interest, caafi.org news suggestions, or inquiries about subscription to the CAAFI Membership group.