Findings & Recommendations

2013
Advanced biofuels are important to the aviation industry’s sustainability, both as a way to diversify our fuel supply and lower our carbon footprint. Development of this new, clean energy industry drives innovation in the American economy, benefits the environment, creates jobs, and strengthens the communities we serve.

– Jimmy Samartzis, United Airlines

The U.S. military and commercial aviation industry together consume more than 20 billion gallons of jet fuel a year. Nearly three billion gallons are consumed by airlines in the Midwest. The cost of jet fuel has more than tripled since 2000, and jet fuel demand in the Midwest is expected to increase by 9% by 2020. For every 5% of Midwestern petroleum jet fuel that can be replaced by biofuels, approximately 3,600 jobs will be created and an estimated 700,000 tons of carbon dioxide on average will be avoided annually.

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Masbi found that a coordinated effort by both private and public interests would be one of the most effective ways to move the Midwest biofuels industry forward and take a pivotal step toward diversifying the nation’s energy supply.

We are proud to release our final report of the Midwest Aviation Sustainable Biofuels Initiative (Masbi). This has been a year-long collaboration that brought together experts representing the entire aviation biofuels value chain from over 40 different public, private, and non-profit organizations. This report highlights an action plan to accelerate the commercialization of biofuels for aviation.

The journey to develop an aviation biofuels industry began in 2006. Aviation is interested in the development of alternatives to petroleum-based jet fuels to address its largest operating cost and most significant impact on the environment. Progress has been achieved in certifying conversion technologies, proving advanced biofuel use in aircraft, and developing sustainability standards. However, significant challenges remain in achieving commercial-scale production of aviation biofuels at prices that airlines can afford to pay.

The benefits of building this industry extend beyond aviation. Developing a commercial market for aviation biofuels has the potential to create jobs, generate economic growth, further contribute to U.S. innovation, and fulfill the nation’s energy security needs.

Commercial aviation in the Midwest consumes nearly three billion gallons of jet fuel per year and has an established infrastructure in place for the efficient delivery of aviation fuels. The Midwest boasts a rich history of agricultural development, clean technology innovation, research institutions, and a vibrant investment community. Midwest governments and policymakers have recognized the importance of the advancement of the biofuels industry. These factors combined highlight the region’s potential.

The recommendations of the MASBI report, if enacted, will accelerate the development of this industry.

Sincerely,

Masbi Steering Committee Members
OVERVIEW

The Midwest Aviation Sustainable Biofuels Initiative (MASBI) is an effort by 40-plus organizations across the aviation biofuels supply chain to develop recommendations to achieve the potential economic, environmental, and energy security benefits that can be delivered from a robust sustainable aviation biofuels industry in the Midwest.

MASBI was led by United Airlines, Boeing, Honeywell’s UOP, the Chicago Department of Aviation, and the Clean Energy Trust. In addition, Argonne National Laboratory chaired an Advisory Council, which included government agencies and non-profit institutions. This summary outlines the initiative’s key findings and recommendations to develop this industry while also considering environmental, social, and economic sustainability. This initiative, the result of a yearlong study by MASBI researchers, builds on crucial steps taken by the industry since 2006 that have resulted in approved pathways, drop-in fuels, certification to fly aircraft commercially powered by advanced biofuels, and more than 1,500 completed commercial flights to date.

With its significant airline presence and agricultural resources, the Midwest holds the promise of potentially contributing to advancements in the aviation biofuels industry. Aviation, feedstock, technology, academic, and policy stakeholders in the Midwest are taking coordinated action to influence the development of this industry. A commercial aviation biofuels industry will result in substantial benefits to the region, country, and the aviation industry as a whole. As the Midwest consumes nearly three billion gallons of fuel per year, for every 5% of petroleum jet fuel that can be offset by biofuels, nearly 3,600 jobs will be created and 700,000 tons of carbon dioxide emissions will be avoided annually. MASBI’s recommendations, summarized below, are important next steps that can propel the aviation advanced biofuels industry toward generating some of the nearly three billion gallons of fuel per year, for every 5% of petroleum jet fuel that can be offset by biofuels, nearly three billion gallons of fuel per year, for every 5% of petroleum jet fuel that can be offset by biofuels, nearly three billion gallons of fuel per year, for every 5% of petroleum jet fuel that can be offset by biofuels, nearly three billion gallons of fuel per year, for every 5% of petroleum jet fuel that can be offset by biofuels.

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RESEARCH AND DEVELOPMENT (R&D)

There has been substantial private and public investment in agricultural R&D. Work has included fundamental understanding of crop properties and their interaction with the environment. This ongoing R&D effort enables a highly productive farm sector to support growing food and feed demand. Agricultural products R&D has also supported the growth of a mature first-generation biofuel industry of ethanol and biodiesel. To address the technical requirements for drop-in aviation, marine, and diesel fuels sustainability criteria, there has been a growing amount of public and private R&D investment in biomass conversion that is capable of producing renewable fuels that are molecularly identical to conventional fuel products.

PROJECTED IMPACTS

The market for blending ethanol with gasoline is nearing capacity generated by increased yield due to breeding and innovative planting, such as crop rotation, and double and cover cropping with crops such as canola and canola, which can be produced between food crop rotations.

1. Improve feedstock production capacity through agricultural innovation. Identify and promote potential additional biofuel production capacity generated by increased yield due to breeding and innovative planting, such as crop rotation, and double and cover cropping with crops such as canola and canola, which can be produced between food crop rotations.

2. Tailor feedstocks to jet fuel. Develop advanced feedstocks tailored for jet fuel production, including the development of an oil seed crop with chemical properties predisposed for jet fuel production.

3. Investigate the impacts of uncertainty on production. Investigate the effects of uncertain conditions, such as changing policy, weather, seasonal intermittency, and co-products on the techno-economic performance of conversion technologies.

4. Advance technologies to convert lignocellulosic biomass. Biomass made up of lignin, cellulose, and hemicellulose (wood, residue biomass such as corn stover) is a very large-volume sustainable feedstock source. Increase investment in bio/catalytic pathways to produce jet fuels from depolymerized biomass, cellulosic sugars, or simple alcohols.

PRODUCTION

The Midwest is home to a robust and growing refining technology industry for both conventional and alternative fuels and has been instrumental in developing and bringing to market promising new technologies. Small, distributed production offers a path to commercialization that reduces risk and increases opportunities for commercial success. However, the approval of new fuels is lengthy and costly, creating an economic barrier to entry for new technologies.

For some technology pathways, there are strong economic drivers initially to produce personal care items, chemicals, and surface transportation fuels, rather than renewable jet fuel, which can be lower-margin but is particularly attractive because of its concentrated buyers and high-volume demand. These markets present opportunities rather than challenges as producers refine their technology, feedstock supply, and production while achieving profitability.
We are fortunate to have the engagement of commercial leaders interested in building a supply chain for sustainable jet fuel. This is an important emerging industry for the Midwest that can be a significant economic driver for decades to come.

– Amy Francetic, CEO, Clean Energy Trust

The Midwest is a vital contributor to the nation’s economy and the global air transport system. Developing sustainable new energy sources for aviation provides economic opportunities and builds on the region’s legacy of leadership.

– Billy Glover, Boeing
The fossil fuels industry. Aviation stakeholders. For the former, identify means to expedite approvals by the U.S. Environmental Protection Agency. For the latter, develop strategic partnerships leading to commercial opportunities. Aviation biofuel is technically ready to scale commercially. At this early stage of development, stakeholders should consider entering agreements with the aim to balance risks with partners, thereby accelerating the rate of industry growth. For example, airlines could consider innovative pricing structures and long-term off-take agreements, investors could require lower cost of capital on investments, feedstock providers could enter into long-term supply agreements with better than market pricing, fuel producers could consider alternative margins, and refiners could consider slightly higher volumes of jet fuel. If all stakeholders are willing to compromise and consider the needs of partners, the industry will reach its potential sooner.

**FINANCING**

Feedstocks are the largest contributor to cost and are the primary sustainability driver in biofuel production. Current prices are too high for cost-competitive aviation biofuel production. New crops developed for advanced biofuels face challenges for adoption and scalability, but have the potential to reduce feedstock costs in the long run. Additionally, primary food crops have an economic advantage over many energy crops, helping to protect food supply. New feedstocks are expected to complement food crops, be used as rotational crops, or begin as waste streams.

**POLICY**

Current biofuel policy measures are often short term and don’t address fundamental inequities in the treatment of fossil fuels and biofuels. Biofuels production relies on long-term capital-intensive investment. Government policy must complement this private investment by providing long-term, reliable market signals as the industry grows to commercial scale.

**SUSTAINABILITY**

Reduced carbon and particulate emissions are a major potential benefit of advanced biofuels when compared to petroleum. However, to realize these positive externalities, biofuels must be produced in a sustainable way. If production is not carried out with sustainability at the forefront, the desired environmental benefits may be lost or minimized, and the resultant fuel may drive negative impacts.

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Building on the strengths and resources available in the Midwest, and with the continued efforts of our partners, this region can chart the course for sustainability leadership in the aviation industry.

– Jim Rekoske, Honeywell’s UOP

As the aviation industry plans for future growth, sustainability must be considered every step of the way. Advances in aircraft technology and sustainable biofuels will position our industry to reduce emissions while maintaining a competitive advantage.

– Rosemarie S. Andolino, Chicago Department of Aviation

MASBI participants are diverse and cover the entire value chain.

Steering Committee
- Iowa Farm Bureau Federation
- Midwestern Governors Association
- National Wildlife Federation
- Natural Resources Defense Council
- Ohio Aerospace Institute
- U.S. Department of Agriculture
- U.S. Department of the Navy
- World Wildlife Federation

Stakeholders
- Air BP
- Airlines for America
- Buckeye Partners
- Cleveland Airport
- Elevance
- Fredrickson & Byron P.A.
- Gas Technology Institute
- GE Aviation
- Gevo
- Global Clean Energy Holdings
- Iowa State University
- Kansas Alliance for Bioenergy
- Kansas State University
- LanzzTech
- Magellan Pipeline
- Metron Aviation
- Monsanto
- Northwestern University
- Paradigm BioAviation LLC
- Purdue University
- Renewable Energy Group
- SkyNRG
- Solazyme
- Sun Grant Initiative/SDSU
- University of Illinois
- University of Nebraska-Lincoln
- Ventri
- Western Illinois University

Program Manager
- OLIVER WYMAN

Advisory Council Chair
- Argonne

Observers
- Illinois Department of Commerce
- Illinois Governor’s Office
- Stern Brothers

* Advisory Council members advised and informed the Steering Committee and Stakeholders on, among other things, existing policy, funding options, and environmental topics related to MASBI. Their involvement does not represent their explicit support of the recommendations, nor their advocacy of specific policy recommendations. All participants are dedicated to and fully supportive of the development of a sustainable commercial aviation biofuels industry in the Midwest.
* Stakeholders participated in the workshops and contributed their high-level knowledge, including their particular expertise, in at least one MASBI Work Group, and contributed to the development of findings and recommendations included in the MASBI Final Report.
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