



October 23, 2019

The Honorable Paul Tonko  
Chairman  
Subcommittee on Environment  
and Climate Change  
Energy and Commerce Committee  
U.S. House of Representatives  
Washington, DC 20515

The Honorable John Shimkus  
Ranking Member  
Subcommittee on Environment  
and Climate Change  
Energy and Commerce Committee  
U.S. House of Representatives  
Washington, DC 20515

The Honorable Frank Pallone  
Chairman  
Energy and Commerce Committee  
U.S. House of Representatives  
Washington, DC 20515

The Honorable Greg Walden  
Ranking Member  
Energy and Commerce Committee  
U.S. House of Representatives  
Washington, DC 20515

Dear Chairman Tonko, Chairman Pallone, Ranking Member Shimkus, Ranking Member Walden, and Members of the Subcommittee:

The Biotechnology Innovation Organization (BIO) is pleased to submit a statement for the record to the to the United States House of Representatives Committee on Energy and Commerce Subcommittee on Environment and Climate Change hearing on "Building a 100 Percent Clean Economy: Solutions for Planes, Trains and Everything Beyond Automobiles."

### **Executive Summary**

BIO applauds the Subcommittee for examining the challenges and opportunities associated with decarbonizing the U.S. transportation sector, with an emphasis on medium and heavy-duty trucks, buses, ships, aircraft, and rail.

Thanks to biotechnology, advances in biofuels made from renewable resources and waste feedstocks can be used to decarbonize our roadways, seaways, and airways. In order to achieve the goal of a 100 Percent Clean Economy for this segment of the transportation sector, stable and supportive policy is critical to drive investment and consumption of sustainable biofuels.

We have already seen the environmental benefits biofuels have provided in decarbonizing light-duty vehicles (LDV). The development and advancement of advanced biofuels will be essential to decarbonizing industries such as long-haul trucking, aviation, and marine shipping.

## **Introduction**

BIO is the world's largest trade association representing biotechnology companies, academic institutions, state biotechnology centers and related organizations across the United States and in more than 30 other nations. BIO members are involved in the research and development of innovative healthcare, agricultural, and industrial and environmental biotechnology products. BIO's Industrial and Environmental Section (IES) represents more than 70 companies leading the development of new technologies for producing conventional and advanced biofuels.

## **Importance of Policy Support**

BIO member companies are developing new agricultural and low-carbon feedstocks, industrial enzymes, and biological catalysts for the conversion of biomass and waste feedstocks into advanced biofuels, alternative jet fuels, renewable chemicals, and biobased products. Utilizing the power of industrial biotechnology, companies across the country are creating a robust biobased economy. Biobased production encompasses a complex value chain, from agriculture through the manufacture of consumer goods, that provides an alternative to the petroleum-based value chain and that brings environmental, economic and other benefits. The biobased economy can generate new markets for agricultural producers, boost innovation in domestic manufacturing, and stimulate sustainable economic growth.

## **Renewable Fuel Standard (RFS)**

Supportive policy has been a vital tool for BIO's member companies who are leading the development of advanced and cellulosic biofuels. The Renewable Fuel Standard (RFS) has spurred research and investment in the development of low-carbon biofuels. The RFS program is a national policy that requires a certain volume of renewable fuel to replace or reduce the quantity of petroleum-based transportation fuel, heating oil or jet fuel. The RFS has enabled the United States to become a leader in the development and deployment of new technologies which has led to the growth of the biobased economy, benefitting farmers and commodity producers, helping revitalize rural economies, creating good paying jobs, and fostering energy independence. The RFS has been a key driver for investment and development of advanced biofuel technologies which have been critical to scaling up and deploying the biofuels used in aviation and maritime applications.

## **Tax Incentives**

Biofuel tax provisions supporting the development of advanced and cellulosic biofuels – particularly the Second Generation Biofuel Producer Tax Credit (PTC), the Special Depreciation Allowance for Second Generation Biofuel Plant Property, the Biodiesel and Renewable Diesel Fuels Credit, and the Alternative Fuel Vehicle Refueling Property Credit – are incredibly important. Availability of these credits are critical as our companies make significant investments to create new agricultural supply chains, build infrastructure for liquid biofuels, and develop innovative new

technologies. These credits have enabled our industry to create new jobs, contribute to rural prosperity, and diversify our nation's energy supply. The biodiesel tax credit has supported the production of biofuels used in aviation.

### Government Support Programs

The Department of Energy's (DOE) Office of Energy Efficiency and Renewable Energy (EERE) invests in clean energy technologies that strengthen the economy, protect the environment, and reduce dependence on foreign oil. U.S. Department of Agriculture (USDA) Rural Development Energy Programs have driven the investment and development of advanced biofuels, creating high paying jobs in rural communities and a value-added market for commodity producers.

According to DOE's *Aggregate Economic Return on Investment in the U.S. DOE Office of Energy Efficiency and Renewable Energy*<sup>1</sup>, research and development (R&D) investments provide significant economic benefits. A total taxpayer investment of \$12 billion (inflation-adjusted 2015 dollars) in EERE's R&D portfolio has yielded more than \$388 billion in net economic benefits to the United States. This R&D coupled with USDA's energy programs has led to rapid development of the biofuels industry.

As a result of these policies, the biotechnology industry has made significant investments in the commercialization of these technologies. The biofuels industry has created billions of dollars of economic output and millions of jobs across the country<sup>2</sup>, while boosting the value of the U.S. agriculture sector by \$14.1 billion.<sup>3</sup> State policy initiatives have also driven growth in the biofuels sector. These policies are bolstered by supportive state policies, like the California Low Carbon Fuel Standard (LCFS) which has increased the value of the clean fuels market by an estimated \$2.8 billion.<sup>4</sup>

Biofuels have gone a long ways in decarbonizing LDV transport. However, to grow the biofuels sector to decarbonize long-haul trucking, aviation, and marine shipping and properly address the climate crisis and other environmental challenges, while growing the economy will require significant government support to spur the development of new and innovative technologies. This will entail maintaining existing policies and research and development while expanding them to support new technologies. Clear and stable policy support and implementation is essential to getting these technologies off the ground.

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<sup>1</sup> Dowd, J. "Aggregate Economic Return on Investment in the U.S. DOE Office of Energy Efficiency and Renewable Energy." (Oct. 2017) Available at <https://www.energy.gov/sites/prod/files/2017/11/f39/Aggregate%20ROI%20impact%20for%20EERE%20RD%20-%2010-31-17.pdf>

<sup>2</sup> See Fuels America, Fuels America Releases New Footprint Analysis: Renewable Fuel Drives Economic Growth. (Apr. 15, 2014). Available at <https://fuelsamerica.org/resources/fuels-america-releases-new-footprint-analysis/> (providing detailed description of study results, data sources, and methodology).

<sup>3</sup> Moschini, G., Lapan, H. and Hyunseok, K. "The Renewable Fuel Standard in Competitive Equilibrium: Market and Welfare Effects." Center for Agricultural and Rural Development, Iowa State University. (Jun. 2017). Available at <https://www.card.iastate.edu/products/publications/pdf/17wp575.pdf>

<sup>4</sup> California Delivers <http://www.cadelivers.org/low-carbon-fuel-standard/>

## Impacts of Uncertainty

We have seen the results when policy is undermined by regulatory uncertainty. The Environmental Protection Agency's (EPA) issuance of waivers exempting refiners from complying with the RFS has detrimentally impacted the sector. The expanded exemptions to refineries have removed billions of gallons of biofuels from the marketplace, resulting in the loss of billions of dollars and thousands of jobs in the biofuels sector.<sup>5</sup> Plant shutdowns like this illustrate the vast impact RFS waivers have on U.S. energy production and local economies. And these impacts are wide reaching. Along with the loss of jobs and industry, investment and development of new technologies grinds to a halt. The administration needs to uphold the intent of the RFS by providing a solution that encourages investment in clean energy innovation.

The expiration and continued short-term extension of biofuel tax incentives has created uncertainty for investors and the industry about the availability of these credits; jeopardizing the long-term investments necessary for the development of advanced and cellulosic biofuels. As a coalition of aviation organizations highlighted in a letter to the House Ways and Means Committee on April 12, 2019<sup>6</sup>, these credits are critical to the development of sustainable alternative jet fuels (SAJF).

Ensuring stable funding of DOE and USDA renewable energy programs are also necessary for the growth of the advanced biofuels industry. The Bioenergy Technologies Office (BETO) within EERE funds vital research and development of technologies to convert our nation's biomass resources into clean, renewable fuels. BETO recognizes that biofuels are especially needed in the aviation industry, where liquid fuels are still the only viable fuel source. BETO is working with related agencies, national laboratories, industry stakeholders, and airline partners to develop research and market opportunities for renewable aviation fuels.

USDA's Biorefinery Assistance Program provides loan guarantees for the development, construction, and retrofitting of commercial-scale biorefineries that produce advanced biofuels. This program has enabled companies to put steel in the ground for first-of-a-kind biorefineries that are producing aviation biofuels.<sup>7</sup>

Federal Aviation Administration (FAA) programs are also critical to support the research and development, commercialization, and deployment of SAJF for the aviation industry. FAA's Office of Environment and Energy's Research and

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<sup>5</sup> Peterson, C., Marshall, R. Loebbeck, D., & Davis, R., "Congressional Biofuels Caucus Members Press EPA to Remedy Damage from SRE Waivers" U.S. House of Representatives (Sep. 20, 2019) Available at <https://www.scribd.com/document/427084785/09-20-2019-Final-Letter-to-Epa-2020-Rvos>

<sup>6</sup> National Air Transportation Association (NATA), "NATA and Industry Aviation Coalition Support Extension of Biodiesel Tax Incentive." (Apr. 12, 2019) Available at <https://www.aviationpros.com/gse/fueling-equipment-accessories/fuel-distributors-suppliers-manufacturers/press-release/21076451/national-air-transportation-association-nata-nata-and-industry-aviation-coalition-support-extension-of-biodiesel-tax-incentive>

<sup>7</sup> USDA. Fletcher, J. (Press Release No. 0195.14). USDA Announces Loan Guarantee to Help Innovative Company Turn Waste Into Renewable Jet Fuel. <https://www.usda.gov/wps/portal/usda/usdamediafb?contentid=2014/09/0195.xml>

Development (R&D) Program provides scientific understanding, development of new technologies, fuels and operations, and analyses to support achieving the Next Generation Air Transportation System (NextGen), and its goals of environmental protection that allow for sustained growth. The NextGen program is working with partners to develop solutions to reduce the impacts associated with aviation noise and exhaust emissions and increasing energy efficiency and availability. In alliance with research institutions and industry stakeholders, the program will accelerate the maturation of engine and airframe technologies to reduce aviation noise, fuel use, and emissions. This program provides the FAA with funding to accelerate the maturation of aircraft and engine technologies and develop alternative jet fuels creating domestic jobs and promoting innovation. FAA's Center of Excellence (COE) is charged with discovering, analyzing, and developing science-based solutions to the energy and environmental challenges facing the aviation industry. Through COE, FAA has been supportive of alternative jet fuel testing and analysis efforts through the ASCENT. This program is working collaboratively with its 16 member and 3 affiliate universities.

Further R&D and policies supporting carbon capture and utilization (CCU) that uses industrial biotechnology conversion processes to capture waste carbon in the form of methane, carbon oxide emissions, or gasified wastes and convert it to renewable and low carbon advanced biofuels, will be critical to reducing carbon and other pollutants while displacing fossil fuels.

The development of policies and regulations that call for even greater reductions in greenhouse gas emissions in transportation and manufacturing would result in significant growth of advanced and cellulosic biofuels.

## **Environmental Benefits**

### **Current Benefits**

We are already reaping the benefits of the development of advanced and cellulosic biofuels. This spring a U.S. Department of Agriculture (USDA) study showed the significant greenhouse gas benefits of ethanol. The study found GHG emissions from corn-based ethanol are about 39 percent lower than gasoline. The study also states that when ethanol is refined at natural gas-powered refineries, the greenhouse gas emissions are even lower, around 43 percent below gasoline.<sup>8</sup> The production of low-carbon, sustainable biofuels, primarily used in LDVs, has resulted in significant GHG reductions, with cumulative CO<sub>2</sub> savings of nearly 600 million metric tons (mmt) since the RFS was enacted.<sup>9</sup>

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<sup>8</sup> Lewandrowski, J., Rosenfeld, J., Pape, D., Hendrickson, T., Jaglo, K., and Moffroid, K. USDA "The greenhouse gas benefits of corn ethanol – assessing recent evidence." (Mar. 25, 2019) Available at <https://www.tandfonline.com/doi/full/10.1080/17597269.2018.1546488>

<sup>9</sup> Unnasch, S. (2019) GHG Reductions from the RFS2 – A 2018 Update. Life Cycle Associates Report LCA. LCA.6145.199.2019 Prepared for Renewable Fuels Association. Available at <https://ethanolrfa.org/wp-content/uploads/2019/02/LCARFSGHGUpdatefinal.pdf>

The greenhouse gas emission reductions and benefits will only expand with the utilization of advanced and cellulosic biofuels in aviation and maritime use. The RFS requires lifecycle GHG reductions of at least 50 percent versus the relevant petroleum-based alternative for a fuel to qualify as an advanced biofuel and 60 percent for cellulosic biofuels. Already advanced and cellulosic biofuel technologies are far surpassing these requirements. As the industry improves its efficiencies and practices the greenhouse gas reductions of approved advanced and cellulosic biofuels are likely to be substantially greater than petroleum derived fuels.

The environmental benefits of biofuels go beyond GHG reductions. Ethanol reduces tailpipe emissions of both hydrocarbons and carbon monoxide, which helps prevent the formation of ground-level ozone. Data from 222 EPA sensing sites show that ozone levels have fallen during the period in which ethanol blending increased. Additional data from the University of Illinois-Chicago show substantial reductions in particulate matter (PM) and benzene with the addition of ethanol.

Since its implementation, California's LCFS has prevented more than 13.7 billion gallons of petroleum from being combusted on the state's roadways since 2011. This equates to avoiding 38 million tons of carbon pollution. According American Lung Association in California, the state's low carbon fuel standard has helped Californians avoid \$1.84 million in public health costs and averted more than 200 premature deaths from pollution.

Continued growth of advanced and cellulosic biofuels will reduce harmful compounds in transportation fuel, improving air quality and human health.

## **Benefits of Decarbonizing Beyond LDVs**

### Aviation Biofuels

Decarbonizing the aviation sector represents a unique opportunity to achieve national security goals, bolster economic development, and provide environmental benefits through the use of sustainable aviation jet fuels. Contrary to the ground transport sector, which can use electric energy, aviation has no near-term alternative to liquid hydrocarbon fuels.<sup>10</sup> The development of SAJF will be critical to meeting the robust goals from the aviation industry to reduce emissions by 2050 to 50 percent of its 2005.<sup>11</sup> The lifecycle greenhouse gas emissions from SAJF can be at least 80 percent lower than traditional fuel.

As the Commercial Aviation Alternative Fuels Initiative (CAAFI) illustrated earlier this year, aviation biofuels are on the cusp of rapid expansion and replication.<sup>12</sup>

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<sup>10</sup> International Air Transport Association (IATA), "Sustainable Aviation Fuels Fact Sheet" Available at [https://www.iata.org/pressroom/facts\\_figures/fact\\_sheets/Documents/fact-sheet-alternative-fuels.pdf](https://www.iata.org/pressroom/facts_figures/fact_sheets/Documents/fact-sheet-alternative-fuels.pdf)

<sup>11</sup> International Air Transport Association (IATA), "Fact Sheet Climate Change & Corsia" Available at [https://www.iata.org/pressroom/facts\\_figures/fact\\_sheets/Documents/fact-sheet-climate-change.pdf](https://www.iata.org/pressroom/facts_figures/fact_sheets/Documents/fact-sheet-climate-change.pdf)

<sup>12</sup> Csonka, S. CAAFI, "General Industry Progress Update." (Apr. 4, 2019) Available at <https://www.biofuelsdigest.com/bdigest/2019/07/29/saf-on-the-cusp-of-rapid-expansion-and-replication-the-digests-2019-multi-slide-guide-to-caafi/>

Due to the goals of the industry to decarbonize, there have been significant investments and partnerships between airlines, airports, governments, and biofuel producers.

The first flight using blended biofuel took place in 2008. Since then, more than 150,000 flights have used biofuels.<sup>13</sup> This summer, United Airlines made history “with the departure of the Flight for the Planet, the most eco-friendly commercial flight of its kind in the history of aviation. On the Flight for the Planet, United became the first known airline to demonstrate all of the following key actions on a single commercial flight: utilization of sustainable aviation biofuel; zero cabin waste efforts; carbon offsetting; and operational efficiencies.” As part of these efforts, United used a 30/70 blend of low-carbon, sustainable aviation fuel provided by Boston-based World Energy, and traditional jet fuel. The biofuel alone achieves a greater than 60 percent reduction in greenhouse gas emissions on a lifecycle basis compared to traditional jet fuel, and using biofuel is one of the most effective ways an airline can reduce its impact on the environment.”<sup>14</sup>

The benefits of biofuels go beyond reducing greenhouse gas emissions. Based on findings in a cooperative international research program led by NASA and involving agencies from Germany and Canada, using biofuels to help power jet engines reduced particle emissions in their exhaust by as much as 50 to 70 percent.<sup>15</sup>

With an ever growing number of partnerships there is potential for rapid growth in this sector.

### Maritime Biofuels

The development of biofuels is critical to reducing greenhouse gas emissions and reducing emissions from the maritime sector. In 2016, the U.S. Navy Great Green Fleet demonstrated the potential of advanced biofuels in reducing emissions in maritime engines. Named to honor President Theodore Roosevelt's Great White Fleet, the yearlong initiative in the John C. Stennis Strike Group (JCSG) used alternative fuel sources, energy conservation measures, and operational procedures to reduce its fuel consumption. The fleet used alternative fuel made from 10 percent beef tallow provided from farmers in the Midwest and 90 percent marine diesel and was cost competitive with traditional fuels. It is used as a drop-in alternative, meaning no modifications to engines or operational procedures are required.<sup>16</sup>

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<sup>13</sup> Le Feuvre, P., IEA Energy Analyst “Commentary: Are aviation biofuels ready for take off?” (Mar. 18, 2019) Available at <https://www.iea.org/newsroom/news/2019/march/are-aviation-biofuels-ready-for-take-off.html>

<sup>14</sup> United Airlines Press Release. “United Airlines Makes History Flying the Most Eco-Friendly Commercial Flight of its Kind.” (Jun. 5, 2019) Available at <https://hub.united.com/united-most-eco-friendly--flight-2638700079.html>

<sup>15</sup> National Aeronautics and Space Administration (NASA). NASA Study Confirms Biofuels Reduce Jet Engine Pollution. (Mar. 15, 2017). Available at <https://www.nasa.gov/press-release/nasa-study-confirms-biofuels-reduce-jet-engine-pollution>

<sup>16</sup> John C. Stennis Strike Group Public Affairs, “The Great Green Fleet Explained” U.S. Navy (Jun. 27, 2016) Available at [https://www.navy.mil/submit/display.asp?story\\_id=95398](https://www.navy.mil/submit/display.asp?story_id=95398)

Continued growth of advanced biofuels will be critical to meet the International Maritime Organization's (IMO) limit for sulphur in fuel oil used on board ship below 0.50 percent by January 1, 2020. Earlier this year international container ocean carrier CMA CGM teamed up with the Port of Rotterdam, Ikea Transport & Logistics Services and biofuel company GoodShipping to test biofuels made from used cooking oil and forest product residues. Not only did it "virtually eliminates" sulfur oxide emissions to meet the IMO goals, it delivered a reduction in carbon dioxide emissions of about 80 percent to 90 percent.<sup>17</sup>

## **Conclusion**

To accelerate the development of advanced and cellulosic biofuels to decarbonize our roadways, seaways, and airways will require maintaining existing policies such as the RFS and tax credits. These policies have allowed the United States to become a leader in the development of advanced and cellulosic biofuels, creating new end user markets for transportation fuels in aviation and heavy-duty transport. Maintaining these policies will drive avoid uncertainty about the market for these technologies.

The transition to a 100 percent clean economy will require multiple solutions. To meet the far reaching goals of decarbonizing our economy and reducing greenhouse gas emission in the transportation sector it is important that Congress recognize the continued demand for liquid fuels. As such, it should work to promote the acceptance of, and where applicable, regulatory preference for, innovative and sustainable advanced and cellulosic biofuels.

Supporting development and deployment of these technologies enable the United States to reduce greenhouse gas emissions in the transportation sector to the benefit of economy, human health, and the environment.

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<sup>17</sup> Wilson, J. "Marine biofuels begin to make headway in ocean shipping" Freight Waves (Mar. 14, 2019), Available at <https://www.freightwaves.com/news/maritime/imo2020-lowsulfurfuel-biofuel-trials>