March 24, 2021

The Honorable Don Beyer
Chairman
Subcommittee on Space
and Aeronautics
Committee on Science, Space,
and Technology
U.S. House of Representatives
2321 Rayburn House Office Building
Washington, DC 20515

The Honorable Brian Babin
Ranking Member
Subcommittee on Space
and Aeronautics
Committee on Science, Space,
and Technology
U.S. House of Representatives
2321 Rayburn House Office Building
Washington, DC 20515

The Honorable Eddie Bernice Johnson
Chairwoman
Committee on Science, Space,
and Technology
U.S. House of Representatives
2321 Rayburn House Office Building
Washington, DC 20515

The Honorable Frank Lucas
Ranking Member
Committee on Science, Space,
and Technology
U.S. House of Representatives
2321 Rayburn House Office Building
Washington, DC 20515

Dear Chairman Beyer, Ranking Member Babin, Chairwoman Johnson, and Ranking Member Lucas:

The Biotechnology Innovation Organization (BIO) is pleased to submit a statement for the record to the United States House of Representatives Committee on Science and Technology Space and Aeronautics Subcommittee hearing entitled, "Examining R&D Pathways to Sustainable Aviation."

Introduction

BIO[1] represents 1,000 members in a biotech ecosystem with a central mission – to advance public policy that supports a wide range of companies and academic research centers that are working to apply biology and technology in the energy, agriculture, manufacturing, and health sectors to improve the lives of people and the health of the planet. BIO is committed to speaking up for the millions of families around the globe who depend upon our success. We will drive a revolution that aims to cure patients, protect our climate, and nourishes humanity.

Our members use technology to enhance cultivation and food production and produce sustainable biofuels, renewable chemicals, and biobased products. These breakthroughs provide a cost-competitive alternative to petroleum's value chain that spur economic development, create jobs, and improve environmental and public health. Companies are utilizing biological processes to convert biomass and

[1] https://www.bio.org/

1201 Maryland Avenue SW
Suite 900
Washington DC 20024
202.962.9200 P
202.488.6307 F
bio.org

waste feedstocks into everyday products while creating new markets for agricultural crops, crop residues, and waste streams – in addition to contributing to a circular economy.

Overview

BIO applauds the committee for holding this hearing on sustainable aviation.

To tackle the climate crisis, it is crucial to lead with science and U.S. innovation. We must incentivize the adoption of innovative and sustainable technologies and practices and streamline and expedite regulatory pathways for new technology solutions to reduce carbon in hard to abate sectors. In doing so, the federal government can support pioneering breakthroughs that reduce greenhouse gas emissions in manufacturing, transportation, and agricultural supply chains to build a stronger, more resilient, and environmentally sustainable economy.

One of these hard to abate sectors is aviation. Currently, the global aviation industry produces around two percent of all human-induced carbon dioxide (CO_2) emissions and 12 percent of CO_2 emissions from all transport sources.[2] In 2018, the United Nation's (UN) International Civil Aviation Organization (ICAO) forecasted these emissions would triple by 2050 and the International Council on Clean Transportation, found that emissions from global air travel may be increasing more than 1.5 times as fast as the UN estimate.[3]

Fortunately, the development and commercialization of sustainable aviation fuels (SAF) represents a viable solution to reduce emissions in aviation— which has no near-term alternative to liquid hydrocarbon fuels.[4]

Reducing Emissions through Innovation

Biofuels produced using biological systems provide a strong and immediate solution to reducing emissions from all forms of transportation, including aviation. Because of biotech innovations, the production of biofuels is becoming more efficient and environmentally sustainable. Biocatalysts, such as enzymes, lower energy requirements, increase reaction rates, can reduce the number of process steps necessary to make chemical transformations. Enzymes are selective, specific, and have a high catalytic rate; they are more efficient, producing chemical products with higher purity and fewer byproducts or wastes. Enzymes are enabling biofuel producers to convert corn stover, wheat straw, wood chips, sawdust, waste, and sugarcane bagasse into fuel, and to collectively increase biofuel yield and energy efficiency throughout the sector. Biocatalysts (e.g. bacteria) are enabling production of fuels from new waste and residue streams.

---

[2] https://www.atag.org/facts-figures.html
[3] https://www.nytimes.com/2019/09/19/climate/air-travel-emissions.html
[4] https://www.iata.org/contentassets/a33c39219430432fb241f7b9ac5a145c/environment.pdf

BIO[5] member[6] companies[7] have led the way in developing and deploying SAF with major airline companies around the world. However, to scale up production to levels needed to meet future growth of air travel and reduce emissions additional research and development (R&D) and incentivizes are needed.

Bolstering Government R&D Programs

Bolstering funding for the U.S. Department of Energy (DOE), U.S. Department of Agriculture (USDA) renewable energy programs, Federal Aviation Administration (FAA) and other government research programs is essential for the growth of SAF and the advanced biofuels industry.

DOE's 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. According to DOE's *Aggregate Economic Return on Investment in the U.S. DOE Office of Energy Efficiency and Renewable Energy,*[8] 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.

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. Bolstering BETO will help fund vital research and development of technologies to convert our nation's biomass resources into clean, renewable fuels, as well as chemicals and industrial products. BETO Systems Development and Integration (SDI) program is working to establish first-of-a-kind integrated biorefineries, that are capable of efficiently converting a broad range of biomass feedstocks into commercially viable SAF.

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. [9]

FAA programs are also critical to support the research and development, commercialization, and deployment of Sustainable Aviation Fuel. FAA's Office of Environment and Energy's 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 the program's goals of environmental protection allow for sustained growth. The NextGen program is working with partners to develop solutions to reduce the

---

[5] https://news.delta.com/delta-enters-offtake-agreement-gevo-10m-gallons-year-sustainable-aviation-fuel-creates-long-term
[6] https://www.lanzatech.com/2018/10/04/virgin-atlantic-lanzatech-celebrate-revolutionary-sustainable-fuel-project-takes-flight/
[7] https://www.velocys.com/2019/10/10/negative-emission-fuel-agreement
[8] https://www.energy.gov/sites/prod/files/2017/11/f39/Aggregate%20ROI%20impact%20for%20EERE%20RD%20-%2010-31-17.pdf
[9] https://www.usda.gov/wps/portal/usda/usdamediafb?contentid=2014/09/0195.xml

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. 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 main universities and five affiliate universities.

Streamline and Expedite Regulatory Pathways for Breakthrough Technology Solutions

Unclear, protracted regulatory pathways are one of the largest barriers to the deployment of innovative solutions that can address climate change. Uncertainty surrounding the approval of pathways and registration for advanced and cellulosic biofuels are also hindering the development of SAF.

The U.S. Environmental Protection Agency's (EPA) delays in approving biofuel pathways and facility registrations have led to an erosion of the Renewable Fuel Standard (RFS) as Congress intended. Developing and producing these fuels and attracting investment to sustainable fuel projects has been curtailed because of EPA's actions. This hampers the growth of rural America and stymies the development of the bioeconomy. Bringing these innovative technologies online will be critical to commercializing SAF and creating a resilient, healthier transportation sector in a post-COVID economic recovery.

Congress should exercise its oversight authority over EPA to ensure the Agency interprets the RFS broadly and accommodates all pathways and approve facility registrations that could fall within the existing statute. Specific areas that would have an impact immediately to accelerate the production of SAF are related to biological carbon capture and utilization (CCU), the interpretation and eligibility of "renewable biomass", the use of biointermediates, and life-cycle and tracking methodologies for sustainable fuels from waste agricultural residues such as corn kernel fiber. This would have immediate benefits for reducing greenhouse gas emissions in the aviation and agricultural sectors by create more demand for waste feedstocks and renewable biomass.

Incentives

Long-term tax incentives have been incredibly important to our companies that are making 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. New, long-term tax incentives are needed to drive new green energy breakthroughs and enable alternatives to become fully established.

As the House Select Committee on the Climate Crisis noted in its Climate Crisis Action Plan, "Congress should strengthen the sustainable aviation fuels tax credit to include a life-cycle carbon intensity requirement and extend it for at least five years to provide market certainty. Congress should consider the potential benefits of separating the sustainable aviation fuel tax credit from the broader biodiesel tax credit."[10]

Enacting a long-term SAF specific tax credit will attract significant investment to the sector, address existing structural and policy disincentives, and ramp up domestic SAF production to meaningful levels.

Health Benefits

The benefits of SAF go beyond reducing greenhouse gas emissions. Based on findings in a cooperative international research program led by National Aeronautics and Space Administration (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.[11]

COVID-19 has highlighted the impact air pollution has on human health and the need to increase the use of biofuels in the transportation sector to improve air quality. Prior to COVID-19, the World Health Organization[12] found that 4.2 million deaths[13] every year occur because of exposure to ambient air pollution. Since then, numerous studies have found that long-term exposure to levels of tiny particulate matter were linked to a significant increase in the mortality rate for COVID-19[14].

Increasing the use of SAF to reduce contrails, particulate matter, and mass emissions compared to conventional fossil jet fuels will improve air quality and human health near airports and reduce the climate impacts of aviation at high altitude.[15]

Conclusion

BIO is committed to working with the Committee, Congress, and the Administration to address the climate crisis. Policy that advances pioneering technology like SAF will lead to breakthroughs reducing emissions in the aviation sector. By supporting science and innovation, we can return our Nation and the world to health and prosperity by taking bold and drastic action to address the climate crisis.

---

[10] https://climatecrisis.house.gov/sites/climatecrisis.house.gov/files/Climate%20Crisis%20Action%20Plan.pdf
[11]: https://www.nasa.gov/press-release/nasa-study-confirms-biofuels-reduce-jet-engine-pollution
[12] https://www.who.int/health-topics/air-pollution#tab=tab_1
[13] https://www.who.int/gho/phe/outdoor_air_pollution/burden/en/
[14] https://www.newscientist.com/article/2241778-are-you-more-likely-to-die-of-covid-19-if-you-live-in-a-polluted-area/
[15] https://www.nature.com/articles/nature21420