Scale-up and Qualification of Net-Zero Sustainable Aviation Fuels from Wet Waste

Cesar Granda
Earth Energy Renewables

This project will enable the world's first demonstration flight on sustainable aviation fuel (SAF) produced from wet waste that reduces GHG emissions by over 100% compared to fossil jet. The U.S. consumes over 26 billion gal of jet fuel annually, with projections for passenger trips to double by 2040. Public demand to reduce the carbon footprint of air travel has resulted in the industry pledging to reduce its carbon footprint by 50% by 2050. Jet fuel ranks amongst the highest operating expenses and represents the primary carbon footprint. There is unprecedented demand for new SAF routes that can cross the "valley of death" and economically scale to deliver drop-in performance with lower carbon intensity when blended with conventional jet fuel. Fuel properties are essential as ASTM qualification of new SAF routes can take millions of dollars, thousands of gal, and years of testing. To address these hurdles, we will advance a new SAF route that arrests anaerobic digestion of wet waste to produce C2-C8 volatile fatty acids (VFA) as the key intermediate. This project will: i) scale the catalytic upgrading of VFA-SAF from lab to pilot, ii) divert wet waste from landfills to achieve >150% GHG reduction and <$3/gal, iii) produce VFA-SAF that meets ASTM "Fast Track" blends specs to enable qualification with ~100 gal and within ~1 year, and iv) produce 3000 gal of blended VFA-SAF for the world's first demo flight.

Our team brings world-class expertise in wet waste-to-VFA processing by Earth Energy Renewables (EER), VFA catalytic conversion by NREL, industrial SAF refinery knowledge by World Energy (formerly AltAir), catalytic process technology scale-up by MATRIC, ASTM jet fuel testing and approval expertise by the University of Dayton Research Institute (UDRI) and FAA, and jet fuel supply chain knowledge and flight demonstration capabilities by Southwest Airlines and Boeing. NREL will derisk the catalytic technology at the 3-gpd bench-scale to optimize process conditions and catalyst formulations, with technical advising from World Energy. MATRIC will then scale VFA biofuel production to the 35-gpd pilot-scale to validate conversion performance and fuel properties. The fuel testing and modeling capabilities of UDRI and FAA will be leveraged to inform conversion process development. To ensure a path to market, our team will work closely with Southwest Airlines, Boeing, and World Energy to map the opportunity space for commercializing VFA-SAF based on supply chain constraints, low carbon fuel policies, regional waste availability, and potential for integration with current HEFA-SAF refineries to accelerate adoption.