DE-FOA-0003178
Topic Area 1: Pre-Pilot Scale-Up of Integrated Biorefinery Technologies
Control number: 3178-1555

Project Title: Demonstration of the ASPIRE feedstock flexible biomass deconstruction and conversion technology at the pre-pilot scale.

Lead Institution: Erg Bio, Inc. (ErgBio)

Partner Institutions: Lawrence Berkeley National Laboratory (LBNL), Advanced Biofuels and Bioproducts Process Development Unit (ABPDU), Sandia National Laboratories (SNL), LCI Corporation (LCI), Next Rung Technology

Background. The 2023 Billion-Ton Report concludes that an estimated 60 billion gallons of low-emission liquid fuels can be generated in the US without compromising the current and future demands of food, feed, fiber, and forest products in the marketplace. The report provides accepted evidence that in a mature market with sufficient supply and demand, sufficient sustainable lignocellulosic biomass (~1.5 billion tons) could be available, at a reasonable price. However, established biological and chemical routes for converting lignocellulosic biomass and waste residues to liquid fuels require further development to de-risk future commercial scale demonstrations. The economics of such processes could be further improved if all the components of lignocellulosic biomass were effectively used. ***If the future is to be fermented it will require inexpensive fermentable sugars derived from these feedstocks that are available at a massive industrial scale.***

To address these challenges, Erg Bio Inc. is a small business that has a pioneering approach to biomass valorization at scale that can use a wide range of biomass feedstocks (e.g., ag residues, forestry residues, dedicated bioenergy crops, MSW, mixed feedstocks) to generate high yields of bioproducts with extremely low carbon intensities and GHG emissions. At the core of the Erg Bio approach is the Advanced Solvent Pretreatment for Integrated Biorefineries (ASPIRE) technology that has been demonstrated at TRL4, achieving 80-95% fermentable sugar release efficiencies from mixed woody feedstocks, ag residue mixtures, sorghum bagasse, and sugarcane bagasse with >99% solvent recovery rate at the laboratory scale. The ASPIRE process uses distillable solvents, such as ethanolamine or butylamine, at moderate temperatures (140 ^{o}C) and pressures (50 psig) that is integrated with a Consolidated Bioprocessing (CBP) *S. cerevisiae* host that secretes the saccharolytic enzymes that liberates sugars and then ferments those sugars into ethanol and other desired bioproducts. This ethanol is then catalytically upgraded into sustainable aviation fuels. This project will progress the technology from TRL4 to a fully integrated demonstration at TRL6, targeting critical energy efficiency and economics identified via TEA while adapting the process for use with Erg Bio's ASPIRE Technology and two feedstocks: corn stover and sugarcane bagasse.