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DE-FOA-0002245 BOTTLE Topic 2 – Summary for Public Release

Upscaling of non-recyclable plastic waste into CarbonSmart™ monomers

Lead Entity: LanzaTech, Inc.

Partners: InEnTec, Lululemon Athletica, Waste Management

Project Director: Dr. Sean Simpson, LanzaTech Co-founder and Chief Scientific Officer

The current plastic crisis has led to an increased urgency to establish effective strategies for re/upcycling plastics and other polymers. To address this challenge, LanzaTech, a global leader in synthetic biology and gas fermentation, is proposing a hybrid technology for upcycling, via feedstock gasification, the non-recyclable fraction of plastic waste to monoethylene glycol (MEG), a monomer used in the production of polyethylene terephthalate (PET), thereby establishing a new waste-to-products value chain. Over the past decade, global MEG production and consumption have both risen by approximately 50%, driven largely by demand for polyethylene terephthalate (PET) resins and polyester fibers. If successful, this project will enable a "one pot" solution for MEG production from waste, non-recyclable plastics, via gas fermentation, saving energy and GHG with advantaged economics. Current MEG production is a multiple step process, with hazardous intermediates; a single-step process offers greener chemistry, improves material and energy efficiency, all while upcycle waste plastics.

This 3-year project, in partnership with leading gasification technology provider InEnTec, and non-recyclable plastic waste sourced from Waste Management and Lululemon Athletica, will also address the intrinsic challenges related to the gasification process and mixed composition of the feedstock, so it will allow the process to upcycle any type of post-recycling plastic wastes and variable waste streams. Furthermore, LanzaTech has already successfully demonstrated 40,000 hours of pilot-scale conversion of unsorted, unrecyclable municipal solid waste (MSW) into ethanol, and completed a 120-day integrated gasification-gas fermentation demonstration with InEnTec.

Using its in-house synthetic biology capability, LanzaTech will optimize the metabolic pathway and engineer an efficient biocatalyst to convert this syngas to MEG at high selectivity. LanzaTech's extensive gas treatment and fermentation expertise will be used to maximize productivity of MEG in a continuous process directly from the real-world syngas, validating an economically viable path for plastic wastes from industry and residuals from municipal waste sorting facilities to chemicals.