Executive Summary: Sustainable Production of Food Grade Liquified CO_2 for Beverage Makers in Ghana

Arela Chemicals is seeking $8M to pioneer the sustainable production of food grade liquefied carbon dioxide for local beverage makers in Ghana. Liquefied CO_2 will be produced in a manufacturing plant by upgrading biogas generated by the anaerobic digestion of locally sourced maize stover. Biogas will be used to generate 100% of the plant's electricity demand, thereby enabling total off-grid operation. Excess methane generated by the plant will be compressed and sold as bio-CNG for additional revenue. Our production approach enables us to eliminate high costs and unreliable supply of electricity while reducing the carbon footprint of our operations. These savings are passed onto the beverage makers by providing them with an up to 50% discount on their liquefied CO_2 costs, thus improving the profitability and sustainability of their operations. The venture will generate EBTIDA margins of up to 44% over an eight-year period from startup.

Makers of carbonated beverages in Ghana face cost challenges because they rely on fossil fuels for CO_2 production and lack a locally available and cheap supply of fuel. Elsewhere, beverage makers source CO_2 from large oil refineries where it is captured as byproduct, purified to food grade quality, liquefied for transport and sold for approximately $60 per ton. In Ghana, mid-sized makers of carbonated beverages generate CO_2 onsite for $600 per ton by combusting imported liquid petroleum gas (LPG) or diesel, while smaller bottlers that lack this capability purchase it locally for over $800 a ton. Local suppliers also produce CO_2 by the same combustion process. The largest makers of carbonated beverages import CO_2 from Europe at $600 a ton. By replacing fossil fuels with a cheaper, renewable, plant-based and locally sourced raw material input for CO_2 production, we will be able to competitively price our CO_2 thereby improving the sustainability and profitability of our customers' operations.

By locating the plant in the rural community, we will reduce the cost and logistical complexity of aggregating the feedstock while contributing to the economic development of rural farming communities by improving the profitability of maize farmers. Our operation will increase their revenue by improving their crop yield with free and reliable access to a nutrient-rich organic fertilizer that is a byproduct of the anaerobic digestion process. The organic fertilizer improves their yield and is much needed in Ghana where maize crop yields are just 20% of that in the United States due to poor access to chemical fertilizer, poor soil nutrition and poor seed quality. Currently, farmers incur a labor cost to remove the stover from the field through a partially controlled burn. We will eliminate this input cost by providing them with a free stover removal service thereby improving their profitability.

Our utilization of maize stover as a feedstock for manufacture will benefit the environment by reducing GHG emissions while improving the respiratory health of the rural community. We will reduce GHG emissions by 7,000 tons each year by eliminating the use of fossil fuels for CO_2 generation, converting bio-CNG to renewable electricity and eliminating GHG emission from burning of maize residue. At the end of each maize harvest, farmers burn the maize stover (a collective term for the husk, leaves, cob and stalk) to clear it from their fields in preparation for the next planting season. By utilizing stover as a feedstock for the anaerobic digester, we eliminate the GHG and suspended particulate matter (SPM) that would have been emitted when the stover is burned. Stover burning injects SPM into the air which is a leading cause of chronic obstructive pulmonary disease. Therefore, our operation improves the air quality and respiratory health of maize farming communities by simply redirecting the maize stover for biogas generation.

Thus far, Arela has developed the business case to confirm commercial viability and identified best-in-class providers of technology and manufacturing equipment in Europe. We have partnered with 228 maize farmers in the Ashanti Region to secure 60% of the stover feedstock required for production. We have also obtained offtake MOUs for 50% of CO_2 production capacity from both a large multinational beverage maker and smaller local bottlers. Upon achieving financial close, the timeline to bring products to market is 18 months which includes 6 months for project development and 12 months for plant construction and commissioning. We are focused on fundraising and have raised $1M in equity investment from a strategic investor.