The Production of Renewable Low Carbon Transportation Fuels and Nutrient Concentrated By-Products through the AWS System

Agricultural Waste Solutions, Inc., ("AWS"), a Delaware corporation headquartered in Westlake Village, California, has developed a unique and transformative solution for the animal manure and ag waste markets. AWS has patented, permitted, and proven a proprietary technology-driven system that converts high carbon, potentially high GHGE (greenhouse gas emissions) manure and carbon wastes into clean burning, carbon negative, renewable transportation fuels (e.g. diesel, jet), clean water and carbon sequestration bio-fertilizers that enrich the soils. AWS by-products can either be recycled back through the agricultural and community environments from which they came, or sold externally, and the closed-loop AWS system recycles nutrients and protects the environment while converting agricultural costs and liabilities into long term, sustainable profit centers for farmers, investors and AWS project partners.

AWS system components are skid-mounted, portable and scalable, allowing the system components to be placed near or at the source of the feedstock, thus eliminating the highest cost of biofuel production – the transportation of the feedstock. The portable design of the equipment also eliminates permanent infrastructure on farms and simplifies permitting while reducing costs and maximizing flexibility should the equipment need to be moved if host site or other market and economic conditions change.

The suite of AWS' recycled nutrient products can be tailored to best capitalize on geographical and market variations in product needs, utilizing the same core processing equipment while simply changing modular cartridges and components in the field. Biofuel production can be varied between diesel and jet fuel, wax, naptha, ethanol, methanol, butanol, propanol, naptha, etc. in order to meet the needs of AWS' biofuels off-take partners and produce the highest profits for the project. Water by-products can be varied between recycled nutrient-balanced irrigation water and recycled potable water in order to best meet the needs of AWS' farm partners. Bio-fertilizer by-products can be varied between dairy bio-fiber horticultural products, nutrient concentrated ash and nutrient-rich biochar, a bio-carbon product and fertilizer product that increases crop yields while increasing water retention and sequestering CO2 from the air and converting it into soil carbon replenishments. Biochar has other farm applications (e.g. bedding, feed supplement) and can be indefinitely stored, transported and utilized as a biologically inert, energy concentrated, high value feedstock for future biofuels and biochar production.

AWS' core equipment modules are patented protected as one Apparatus Patent, and the overall AWS process is protected by a Methods Patent. The core AWS equipment modules consist of:

- **Solids Recovery Module (SRM):** Removes NPK nutrients from liquid manure as a high energy solids feedstock for gasification, while also producing a nutrient-balanced fertilizer water/WTM input
- **Gas Production Module (GPM):** Creates a high-quality bio-syngas, nutrient rich biochar and nutrient concentrated ash from the nutrients recovered by the SRM and other biomass inputs
- **Water Treatment Module (WTM):** Processes the discharge waters from the SRM and GPM for beneficial on-farm reuse, including potable water if necessary, while capturing ammonia and sulfur
- **Gas Cleaning Module (GCM): T**he bio-syngas is cleaned and conditioned to become a no-sulfur feedstock for energy generation in the form of biofuels, heat and electricity for the process
- **Liquid Fuel Module (LFM):** Converts the bio-syngas and/or biogas into no-sulfur biofuels and waxes

AWS' low-carbon biofuel production from high-carbon manure feed stocks, when coupled with AWS' nutrient-rich biochar utilization, produces a negative Carbon Intensity (CI) biofuel and a negative carbon footprint from animal farming. This proves that manure nutrients can be 100% recycled in a fashion that has a positive impact on our environment while creating farm profit centers from nutrient recycling.