

# Transforming Biogas into High-Quality RNG and Sustainable CO<sub>2</sub> Solutions



## Executive Summary of ETI's Unique Water-Based Biogas Purification Systems with integrated CO<sub>2</sub> Uses for Wastewater Treatment

As an introduction to our company, we would like to first explain why Energy Tech Innovation, LLC (ETI) was formed. The initial mission of ETI was to focus on developing and bringing a new lower cost biogas purification system to the marketplace and to also consider beneficial uses of the carbon dioxide (CO<sub>2</sub>) by-product gas for wastewater treatment purposes. For some time, the biogas energy market has needed a simpler - lower cost system to purify biogas into Renewable Natural Gas (RNG) and that is what ETI has successfully developed. ETI also achieved its second goal by developing biogas-CO<sub>2</sub> beneficial use processes that integrates with wastewater treatment processes as a value-added application.

ETI's biogas purification systems are based on "biogas water wash technology" that has been the most commonly used method to upgrade biogas into RNG world-wide. However, ETI's new system approach is simpler, less costly and our company offers the use of the carbon dioxide (CO<sub>2</sub>) by-product gas for beneficial wastewater treatment uses. **"So nothing goes to waste with ETI"**. Our unique biogas re-engineered system has been developed from a culmination of more than 30-years of biogas industry experience that includes in-depth knowledge of gas treatment processes and the use of biogas in a broad range of energy in the energy sector.

Through the continued commitment to our company mission, ETI has developed and patented two lower cost water-based biogas purification systems and patented two biogas-CO<sub>2</sub> delivery processes for wastewater treatment applications. In addition, ETI is currently pursuing additional biogas-CO<sub>2</sub> patents. ETI's patented biogas purification water wash systems also include an optional CO<sub>2</sub> removal polishing process. Regarding the patents above, ETI holds patents in the U.S. and internationally. ETI's patented systems are simple to operate and can provide cost savings of 30% or more as compared to competing systems. Additionally, our systems provide robust biogas cleaning capability that removes problematic H<sub>2</sub>S, ammonia, VOCs and siloxanes while producing purified methane levels up to 99.7% when combined with our CO<sub>2</sub> removal polisher. ETI's RNG methane system product gas content is among the highest of any commercial biogas purification company in the marketplace.

The biogas water wash – gas separation process operates on the principle that methane (CH<sub>4</sub>) has very low solubility in water, while CO<sub>2</sub> is highly soluble (i.e. 25x times higher). In this process, biogas and water mix in a vessel under pressure and the methane that is not soluble rises and exits the top of the vessel. The CO<sub>2</sub> is absorbed into the water and exits out the bottom of the vessel as supersaturated carbonated (CO<sub>2</sub>) water. The CO<sub>2</sub> water that exits this process has been developed by ETI into a patented delivery process that can be integrated to deliver the CO<sub>2</sub> to various wastewater processes for beneficial uses. ETI has taken this well-proven process and re-engineered it into a suite of innovative biogas purification-CO<sub>2</sub> patented systems.

**Early on, we realized that biogas-CO2 is a significant resource that has been overlooked and underutilized.** Biogas sites produce thousands of CO2 tons per year that can be used to replace industrial supplies of tankered CO2 for various wastewater treatment applications. **And now with our biogas-CO2 solutions, ETI has significantly differentiated itself in the biogas industry with the combination of our lower cost patented biogas purification systems and our patented CO2 processes for beneficial uses in wastewater treatment.** ETI is the only company in the market space currently focused on biogas purification and utilizing supersaturated carbonated CO2 with its patented process for wastewater treatment applications. Our unique biogas-CO2 beneficial use process is synergistic in wastewater treatment operations where it can significantly reduce site carbon emissions and add value in the low-carbon energy markets as they continue to develop.

**More specifically, ETI's two patented CO2 use processes have very broad wastewater treatment applications.** We offer integrated water-based biogas purification systems that can utilize the biogas-CO2 for a number beneficial uses including for pH related process applications, as an inorganic carbon and for the separation of solids in wastewater treatment. In addition, ETI's biogas-CO2 patented processes can be integrated with any biogas purification technology. The beneficial use of the biogas-CO2 can represent an additional six figure annual dollar (\$) value at various wastewater treatment plants that produce biogas. ETI's example beneficial CO2 uses for wastewater treatment include; pH adjustment, chlorine disinfection, phosphorous removal, dissolved gas flotation (DGF) for solids separation, preventing struvite deposit formation, increased biogas production and other uses.

**ETI can purify all biogas from all digester sources.** Biogas is produced from natural occurring microbes that consume organic waste materials under anaerobic (oxygen deficient) conditions typically within tank/covered digesters systems. The biogas is comprised of a mixture of primarily methane and carbon dioxide with trace gas contaminants. ETI's water wash systems can purify and upgrade the biogas from any type of digester including wastewater plants, food/beverage processing, agra-industry operations and from others sources.

**Facilities with wastewater processes such as; WWTPs, food/beverage and agra-industry facilities that have biogas digesters are very synergistic with ETI's water-based biogas purification systems.** The main process attractiveness of our systems is that we provide simpler, lower-cost, easier to operate systems while producing high-quality RNG. Facility operations personnel want "simple" and process systems that do not make their work life more difficult – this is what ETI is able to provide. ETI's system offerings resonates with potential end-users because it is easy to show the simplicity of our systems.

**ETI's systems are available through direct equipment sales to end-users. ETI is also open to partnering arrangements and to technology licensing for our patented processes. In addition, ETI provides consulting services as biogas subject matter experts to assist in the siting, process design integration and the overall development of biogas-RNG projects.** ETI has the expertise to identify various synergies at a facility and within the surrounding area and this approach can be very beneficial in either self-development situations or with project design/development companies. ETI is currently working with a well-established fabricator in Wisconsin (U.S.) that has the capabilities to integrate the system components including; the pressure vessels, pumping skids, gas compression, controls and other miscellaneous equipment for our systems. For more information visit: <https://www.energytechinnovationsllc.com/>