# Executive Summary

Founded in 2003 and based in Abingdon, U.K. and Columbus, Ohio, Green Biologics (GBL) is a privately-held industrial biotechnology company focused on manufacturing high value four-carbon chemicals with an emphasis on n-butanol from renewable feedstocks. The Company is focused predominantly on the $5 billion n-butanol market with a competitively priced renewable alternative. GBL is actively commercializing the Company’s technology in China, the U.S., Brazil, and India. GBL has 40 full-time employees including 12 PhD’s.

## Company Highlights

* **Large market opportunity**

GBL is focused on key high-value products including renewable n-butanol and acetone using advanced ABE (acetone, butanol, and ethanol) fermentation technology. Both n-butanol and acetone serve as “drop-in” chemical building blocks for many common products including paints, coatings, inks, adhesives, plastics, fragrances, pharmaceuticals and fuels. Acetone and n-butanol currently represent an existing chemicals market opportunity exceeding $10 billion annually.

* **Proven ability to scale technology to commercial production levels**

While many competitors are still attempting to build demonstration facilities, GBL has demonstrated production viability at a fermenter scale of 3.2 million liters (50k tonne production line) in China, with concrete plans to commercialize technology in the U.S., Brazil, and India.

* **Flexible cellulosic technology enables low cost production from non-food feedstock**

GBL’s 300+ microbial strains and proprietary process designs are able to utilize a wide range of cellulosic feedstocks that are economical in their respective local geographic markets. GBL’s low cost technology platform enables a 30-40% cash cost advantage over petroleum-based alternatives.

* **Robust product pipeline for continued growth**

While n-butanol and acetone are market-ready products for GBL, the Company has initiatives to tap into other C4 derivatives markets such as 1-butene and butadiene, worth over $40 billion. Butyl acrylate, butyl acetate, and glycol ethers offer additional opportunities in markets trending toward renewables applications in paints, coatings and adhesives. In fuels, blend stock opportunities in diesel and gasoline represent an $80 billion market, and the 116 BGPY (billion gallons per year) aviation jet fuel represents a market worth over $270 billion.

* **Key partnerships with leading chemical partners drives capital efficient operating model**

Green Biologics is building production capacity in key markets with access to a diverse set of feedstocks. GBL’s multi-pronged approach includes licensing, retrofitting existing plants, co-locating bolt-on facilities, and co-investing in new production plants. This approach provides diversity in revenue streams. GBL’s rollout strategy leverages key collaborations with existing producers of bioethanol and/or feedstocks (e.g. sugar cane/bagasse or pulp) using existing assets to ensure a lower capital cost of entry.

* **Seasoned management team with proven track-record in the renewable chemical space**

Green Biologics has assembled a world-class management team with extensive commercialization and operating experience in both the industrial biotechnology and petrochemical sectors. Many of management’s prior companies have exhibited high levels of growth and technological leadership in their industries. In addition, Green Biologics maintains a multi-disciplinary R&D team, including 12 PhD’s on staff, that continues to add to GBL’s portfolio of patent-protected products and processes.

# Overview of Green Biologics

Green Biologics produces acetone and n-butanol using a technically advanced ABE fermentation process. ABE fermentation is a commercially established process that uses Clostridium bacteria to produce acetone, n-butanol, and ethanol from various renewable feedstocks including corn, corn stover, sugar cane, sugar beets, woody biomass, and bagasse, among others.

GBL’s products are building-block molecules for critical global industries including paints, coatings, inks, adhesives, plastics, fragrances, and pharmaceuticals. Global demand for n-butanol as a chemical exceeds 3.5 million tonnes per year with a total downstream C4 and derivatives chemical market opportunity of more than $50 billion.

GBL’s technology enables the cost-effective production of high value products from the fermentation of low-cost feedstocks (e.g. corn stover, woody biomass, sugar cane bagasse). GBL’s value proposition is particularly attractive to bioethanol producers and other feedstock processors, who are faced with depressed operating margins and are actively seeking alternative high-margin revenue streams. GBL’s n-butanol technology provides the means of producing higher value end products, while leveraging existing production assets (bioethanol plants, pulp mills and sugar mills) in a capital efficient model.

The Company’s core technology platform is based on an established commercial fermentation process using its proprietary library of over 300 Clostridium organisms as biocatalysts. Green Biologics maintains a number of patents and has a broad portfolio of proprietary technology.

GBL was formed in 2003 in Oxford, U.K., generating its initial revenue from contract research and grants.. On December 31, 2011, GBL merged with butylfuelTM Inc., an Ohio-based biobutanol company, enhancing their North American commercial and technical presence.

GBL plans to scale-up in a capital efficient manner by leveraging existing assets including ethanol plants in the U.S. and sugar mill plants in South America and Asia to serve the fast-growing demand for renewable n-butanol. Green Biologics has shipped initial quantities of cellulosic n-butanol to North America to seed the market and develop commercial relationships. GBL is currently negotiating partnerships and off-take agreements with downstream users to ensure maximum realizations from production.

The Company is led by a highly experienced management team who have developed a strong portfolio of proven technology to deliver lower cost production than competitors. This technology advantage is based upon Green Biologics microbial fermentation and process capability, backed by an unparalleled and protected microbial strain library and proven performance enhancement capabilities using conventional and microbial engineering techniques.

Green Biologics has investors including several leading venture funds including Capricorn Venture Partners, the Morningside Group, and Oxford Capital Partners.