# MARQUIS ENERGY GLOBAL

## The Next Generation of Bio-Ethanol

**Recent technological advancements in biofuel production have positioned the new generation of bio-ethanol as a crucial tool for decarbonisation, thanks to its versatility, availability, and affordability. Nearly 50 years into its journey, Marquis has focussed on continually innovating towards a circular carbon economy to distribute this low-carbon energy source on a global scale.**

Situated on the river in Hennepin, Illinois, the Marquis production facility is the largest dry-mill bio-ethanol facility in the world, producing 1.5 billion litres of bio-ethanol annually. As part of the Marquis group of companies, Marquis Energy Global (MEG) was established in Singapore in 2017, with a presence in both Asia and Europe. Committed to the circular carbon economy, MEG ensures the efficient transportation and distribution of this low-carbon fuel worldwide, enhancing the sustainability impact of Marquis.

### TECHNOLOGICAL ADVANCEMENTS

Bio-ethanol has significantly evolved to become more sustainable, with dramatic improvements in crop yields being a key contributor. Since the 1920s, corn yields have increased sevenfold, with some of the highest yields surrounding the Marquis Industrial Complex, surpassing 200 bushels per acre.

As part of the International Sustainability and Carbon Certification (ISCC) process, Marquis collaborates with local farmers to promote transparency and sustainable farming practices, enhancing soil health and ensuring all emissions (Scope 1, 2, and 3) are measured, calculated, and verified. Advancements in seed technology and precision farming have driven yields up while enabling site-specific operations, reducing waste and enhancing productivity with precise input application, resulting in less fertiliser usage and reduced irrigation.

The Marquis Industrial Complex is strategically located on top of the Mt. Simon sandstone formation, ideal for $CO_2$ storage. The Marquis Carbon project, set for completion in 2025, will permanently store 1.2 million tonnes of $CO_2$ annually through Bio-Energy Carbon Capture and Storage (BECCS). Additionally, the facility is installing Combined Heat and Power (CHP) to reuse heat generated during production, further trending the Marquis bio-ethanol CI towards net zero and even negative values.

These advancements ensure that corn-ethanol and Marquis meet stringent sustainability criteria, maintaining their status as competitive and environmentally friendly energy sources.

### Decarbonising Transport

Marquis Energy Global (MEG) plays a pivotal role in reducing greenhouse gases (GHGs) in transportation by distributing low-carbon bio-ethanol to the EU and Asia. This fuel is utilised by fuel blenders to decrease GHGs and emissions in petrol.

Since the implementation of the Renewable Energy Directive (RED) in 2009, the EU has set ambitious renewable energy targets for transportation, with bio-ethanol being integral to these efforts. In 2019, the use of bio-ethanol in the EU reduced GHG emissions by an estimated 9 million tonnes, equivalent to removing approximately 2 million cars from the road. A study by the University of Illinois at Chicago found that higher ethanol blends can reduce vehicle emissions, lower GHGs, and improve urban air quality.

Bio-ethanol is also making strides in aviation as a sustainable feedstock for Sustainable Aviation Fuel (SAF). Marquis is exploring the feasibility of building a SAF plant to further decarbonise both road transport and aviation. In aviation, bio-ethanol can be converted into SAF, reducing emissions from combustion and the formation of contrails, which are significant sources of pollution.

### Alternative Sustainable Options to Electric Vehicles

Bio-ethanol presents a practical and affordable alternative to electric vehicles (EVs), especially in regions where EV infrastructure is underdeveloped. Its compatibility with existing fuel infrastructure allows for immediate reductions in greenhouse gas emissions and air pollutants. In densely populated Asian megacities, crop-based bio-ethanol offers a versatile fuel solution that can be rapidly deployed to improve air quality and reduce carbon footprints.

Several automakers have recognised the benefits of hybrid vehicles. A comparative study conducted in the EU evaluated Battery Electric Vehicles (BEVs) against Plug-in Hybrid Electric Vehicles (PHEVs) fuelled with an E85 (85% bio-ethanol) blend. The findings revealed that hybrids combined with bio-ethanol could have lower emissions than BEVs. This approach provides an option that uses fewer natural resources for battery production due to the smaller battery size required for hybrids.

Marquis is also pioneering next-generation fuels with even lower carbon intensity. Partnering with LanzaTech, Marquis is utilising biogenic $CO_2$ from the fermentation process and enzymes to produce e-fuels. Actively working on this breakthrough to prepare for the future of no-carbon fuels, this method allows for the recycling of $CO_2$ already released into the atmosphere.

## Sustainable Aviation Fuel in Singapore and Asia

Bio-ethanol has been a common oxygenate for on-road fuel in Asia since the early 2000s and has emerged as a key component in the quest for sustainable energy in the region. For aviation, Singapore recently introduced the Sustainable Aviation Air Hub Blueprint, mandating the use of Sustainable Aviation Fuel (SAF). A key advantage of this initiative is its feedstock-agnostic approach, fostering competition and innovation. This inclusive policy framework enables the integration of various sustainable feedstocks, including crop-based bio-ethanol, into the aviation fuel supply chain. By creating a framework to increase SAF volumes, Singapore promotes competitive pricing and enhances the overall sustainability of aviation fuel.

Building on these benefits, Marquis has strategically established storage tanks in Asia, optimising energy and cost savings in the bio-ethanol supply chain. Marquis is actively involved in promoting the use of bio-ethanol in Singapore, aligning with Singapore's Green Plan Roadmap.

## ADVANCING A SUSTAINABLE FUTURE THROUGH COMMUNITY AND INNOVATION

Reflecting on the advancements and potential of bio-ethanol, Marquis leads the way towards a circular carbon economy. Rooted in community, Marquis envisions a future where the next generation can enjoy a more sustainable world with less carbon. Marquis believes that these strong community ties foster better innovations, supporting both the environment and society for a harmonious and sustainable energy future.

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