



Deere & Company
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Carey Bylin

Industrial Strategies Division
California Air Resources Board (CARB)
1001 I Street, Sacramento, CA 95814

Re: SB 1075 Report: Hydrogen Development, Deployment, and Use, California Air Resources Board, Sacramento, CA.

Dear SB 1075 Report Development Team,

John Deere appreciates this opportunity to submit comments to inform the preparation of the *SB 1075 Report on Hydrogen Development, Deployment, and Use* (“*the Report*”) to CARB, California Energy Commission (CEC), California Public Utilities Commission (CPUC), and California Governor’s Office of Business and Economic Development (GO-Biz).

Since its founding in 1837, Deere has been committed to enabling agricultural producers to operate more sustainably and profitably through leading-edge technology and innovation. Deere believes that precision agriculture practices and equipment are the key to continuing to improve overall agricultural sustainability, including reducing greenhouse gas emissions from agricultural equipment by both improving operational efficiency and incorporating the use of alternative fuels. Deere has recently highlighted advancements in [electric equipment](#) and alternative liquid fuels in a [multi-fuel tractor](#), but hydrogen is not currently a viable fuel for the off-road sector.

John Deere has extensively evaluated the potential of many renewable fuels to power equipment and machinery in the future, including hydrogen power technologies. While hydrogen will play an important role in reducing emissions from many parts of the transportation sector, it presents unique challenges for the off-road sector, including Deere’s agriculture and construction sectors. In brief, these challenges include:

- **Tank size and cost for mobile vehicles:** Off-road machines operate at high loads for extended time in fields and forests, often remote areas. Most times, fuel is delivered to the machines, instead of machines going to fueling stations. H₂ as a gaseous fuel requires at least seven times the storage space than that of diesel, even at 700 bar pressure. 700 bar storage systems would carry premium costs for farmers, and equipment capability and actual field refueling time remain uncertain.
- **Fuel cell durability and safety:** Off-road machines operate in harsh environments and a broad range of ambient conditions. Both ambient temperature and air cleanliness pose challenges to fuel cell durability and significantly increase the cooling system size for low ground speed off-road vehicles. Worksite safety associated with pressurized tanks, non-visible flames of H₂ combustion, and mobile refueling would require extensive validation and new protocol development, as well as emergency management systems.

- **Efficiency for off-road vehicles:** Although hydrogen fuel cells offer high thermal efficiency at partial loads, off-road machinery operates at high loads most of the time (e.g. pulling heavy equipment like planters and sprayers). As a result, the expected thermal efficiency benefit may not be realized due to increased parasitic losses from heat rejection and electric to mechanical power conversions.

Given these constraints, we urge CARB to avoid any regulations or mandates that would require off-road vehicles to integrate hydrogen power. For off-road vehicles to meet their full potential for reducing carbon emissions, while delivering the power and functionality demanded by farmers, roadbuilders and other customers, a wide range of alternative propulsion technologies will be needed. Forcing off-road machines toward any single technology or pathway will lead to market inefficiencies, higher costs, and fewer choices for commercial and residential customers.

Deere is ready to support producers, industry, and government in our shared goals of reducing carbon intensity of agricultural operations and would welcome the opportunity to meet with any members of the SB 1075 Report Development Team to learn about the considerations for hydrogen deployment in the off-road sector.

For questions or for further information regarding John Deere's comments, please contact Danan Dou, Chief Technologist for John Deere Power Systems at Doudanan@johndeere.com 319-231-1092.

Thank you for your consideration on this important issue.