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DME and Innovative Fuels, Decarbonizing CA's Existing Transportation

Please see attached document.

Additional submitted attachment is included below.

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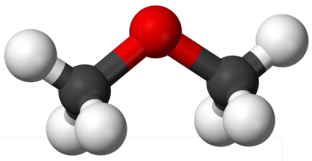
July 29, 2020

Commissioner Patty Monahan
State of California
California Energy Commission
1516 Ninth Street
Sacramento, CA 95814

RE: The Role of DME as a Pathway to Zero-emission Mobility and Carbon Neutrality

Dear Commissioner Monahan,

Oberon Fuels (Oberon) respectfully submits these comments in response to the July 29, 2020 IEPR Workshop on Near-zero Emission Vehicles and Low Carbon Fuels (Docket #20-IEPR-02). Based on dimethyl ether (DME)'s clean-burning properties and its ability to be produced in-state, to reduce emissions and decarbonize transportation in three different ways, and to be produced from a variety of waste streams and renewable feedstocks, the CEC should consider the inclusion of dimethyl ether (DME) in the IEPR update.



Background. DME is an organic molecule, as shown above, that can be made from a variety of methane sources and waste streams. Feedstocks such as animal waste, landfill gas, and food waste can be used to make DME. Argonne National Laboratory estimates DME made from renewable sources to offer 85-101% reduction in greenhouse gases in its 2016 update of GREET. In addition to its ability to made from local feedstocks, this molecule can lead to cleaner trucks on the road and the decarbonization of transportation in three ways due to its unique properties: 1) using DME as a diesel replacement, 2) blending DME with propane, and 3) using DME as a hydrogen carrier to power hydrogen fuel-cell electric vehicles.

DME as a Diesel Replacement. For over 20 years, DME has been recognized as an excellent diesel replacement fuel. DME (is a clean-burning, non-toxic, potentially renewable fuel. Its high cetane value (55-60) and quiet combustion, as well as its inexpensive fueling system, make it an excellent, inexpensive diesel alternative that will meet strict emissions standards and facilitate putting cleaner trucks, particularly Class 8 trucks, on the road.

DME has been used for decades as an energy source in China, Japan, Korea, Egypt, and Brazil, and it can be produced domestically from a variety of feedstocks, including biogas from organic waste produced in cities or by agricultural operations. Ideal uses in North America are in the transportation, agriculture, and construction industries. DME can be made from a range of options that can make it extremely competitive if not significantly more affordable than traditional diesel.

DME is a gas under ambient conditions. However, because it can be stored as a liquid under moderate pressure, it eliminates the need for the high-pressure containers used for CNG or cryogenics, as in the case of LNG. DME's easy handling properties make fueling and infrastructure relatively simple and inexpensive.

DME is approved as a renewable fuel under the U.S. Environmental Protection Agency's Renewable Fuels Standard, making it eligible for RINs credits when made from biogas with the Oberon process. The EPA estimated that biogas-based DME offers a 68% reduction in greenhouse gases. DME has also been issued specifications by ASTM International and the International Organization for Standardization (ISO) to ensure that as DME is rolled out as a fuel the right standards and regulations are in place to ensure a robust supply chain.

DME for Propane Blending. The second way that DME can be used to put cleaner trucks on the road and decarbonize transportation is to blend it with propane for use in propane-powered vehicles. Up to 20% DME can be blended with propane and no changes to the vehicles or fueling infrastructure are required. As mentioned, under ambient conditions, DME is a gas that can be stored as a liquid under moderate pressure, making it ideal for blending with propane.

By blending propane with DME, already clean-burning vehicles can continue to reduce its emissions while providing the most vulnerable populations – children on school buses, residents relying on paratransit services – access to affordable, clean transportation. As calculated by the California Air Resources Board (CARB), the current carbon intensity (CI) score of propane is 83 gCO_2e/MJ (ultra-low-sulfur diesel has a CI near 100 gCO_2e/MJ). CARB has calculated that, when renewable DME (rDME) is made from dairy biogas (which itself has a CI of -150), rDME has a CI value of -278. With only a 5% blend of rDME, propane's baseline CI value decreases from 83 to 65, and at a 20% blend the CI value decreases to just 11, enabling propane to approach carbon neutrality in an economic manner using the same vehicles and fueling infrastructure.

The combination of DME's handling properties, its ability to be produced from diverse, abundant, renewable resources, and its significant greenhouse gas-reducing qualities make it an excellent choice for blending with propane in the transportation sector and beyond.

DME as a Hydrogen Carrier. The third way in which DME can decarbonize transportation is as a hydrogen carrier. DME is an excellent carrier molecule for transporting hydrogen to power a new generation of light- and heavy-duty, fuel-cell electric vehicles and to provide increased supplies of renewable hydrogen:

- DME is particularly dense in hydrogen, with six hydrogen atoms on each DME molecule.
- DME can be made from a wide variety of renewable feedstocks, creating a new pathway for renewable hydrogen production.
- DME liquefies at low pressure (~73 psi), making it much easier and less expensive to transport than hydrogen, which can be compressed at up to 10,000 psi of pressure.

- Converting DME into hydrogen a simple, inexpensive process compared to natural gas to hydrogen conversion.

These qualities mean that the roll-out of increased DME production, DME-powered trucks, and blending DME with propane can also accelerate the expansion of hydrogen fueling infrastructure. As trucking fleets begin to use DME as a diesel replacement and/or blending it with propane, the same equipment and feedstocks can also be used to bring DME directly to hydrogen fueling stations, where it can easily be converted to power fuel-cell electric vehicles as well. With DME engines and trucks in development now, propane/DME blending tests moving forward, and with hydrogen vehicles pushing into the market, these three fuels can quickly become natural allies – three different applications for the same molecule DME.

Innovative Fuels like DME Create Opportunity. In addition to its emissions benefit and multiple uses, one of the key features of this molecule is its ability to create opportunity: opportunity for feedstock producers like dairy farmers to generate additional revenue, opportunity for communities in which DME is produced to benefit from reduced emissions and improved air quality, and opportunity for job creation. Just two days ago, we welcomed five new plant operators at our site in Imperial Valley who came from the local talent pool and began the virtual training process. We are in the process of hiring four more plant operators. These positions offer head-of-household wages and full benefits in the CA region hardest hit by COVID and is experiencing unemployment north of 27% .

CEC Funding. In 2019, Oberon was awarded a $2.9 million CEC grant to upgrade its pilot DME production facility to demonstration scale. Located in Imperial Valley, this facility first came online in 2013 and provided fuel-grade DME for global vehicle demonstrations with Volvo Trucks, Mack Trucks and Ford. This grant will facilitate the first production renewable DME in the US and is slated to come online in early 2021. Thank you and the CEC team for investing in in-state renewable fuel production that could also serve as a source of in-state, renewable hydrogen production.

As the CEC updates the IEPR, we urge you to include innovative fuels like DME in the update as they can play a key role in decarbonizing existing transportation while creating opportunity for the communities in which it is produced.

Sincerely,

Rebecca Boudreaux

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