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Comment Received From: Rebecca Boudreaux
Submitted On: 7/14/2017
Docket Number: 17-IEPR-10

Why Dimethyl Ether (DME) is a â€œRenewable Gasâ€ and should be classified as such

Oberon Fuels
2159 India Street, Suite 200
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(619) 255-9361

July 14, 2017

Oberon Fuels Comments re AB1383 & 2017 IEPR

Docket #: 17-IEPR-10 Project Title: Renewable Gas

Comments from: Rebecca Boudreaux, Ph.D.
President
Oberon Fuels

Submitted: Via online docket portal, July 14, 2017

Comment title: Why Dimethyl Ether (DME) is a â€œRenewable Gasâ€ and should be classified as such

Dear Chairman Weisenmiller:

Oberon Fuels respectfully submits these comments in response to the SB1383 Draft White Paper in preparation for the 2017 Integrated Policy Report.

As the State of California and its agencies consider its Short-Lived Climate Pollutant (SLCP) reduction strategy, DME (dimethyl ether) should be integrated into the stateâ€™s strategy moving forward. DME is a form of renewable gas and is a near-term, viable solution as a carbon-negative diesel replacement transportation fuel.

DME is a clean-burning diesel replacement that:
â€¢ Is made from methane-containing, local feedstocks: dairy manure, agricultural waste, landfill gas, food waste, which can result in greenhouse gas reductions between 68-101% when used in standard compression-ignition engines as calculated by the EPA and DOEâ€™s Argonne National Laboratory. (SAE International Paper #2016-01-2209)
â€¢ Is the first carbon-negative, compression-ignition fuel. Based on calculations from Lifecycle Associates, DME produced from renewable feedstocks by the Oberon process are carbon negative.
a. CI (carbon intensity) of -5 for conversion of food and yard waste to DME. In the CARB Multimedia Assessment on DME Tier 1 report, Table 8.4 (page 63) highlights the carbon intensity of Oberon DME, produced from unscrubbed (60% methane) high solid anaerobic digestion of food and yard waste.
b. CI of -114 (68% dairy gas to DME) to -237 (100% dairy gas to DME). Dairy gas converted to DME results in a large negative CI value due to avoided emissions. While 100% dairy gas can be used to produce DME and heat the system, it is likely that many projects will use natural gas to heat the system and reserve the dairy gas for conversion to DME.

â€¢ Generates NO sulfur and NO soot/particulate matter (PM), making it easier to control NOx emissions. Performs like diesel, handles like propane.
â€¢ Offers diesel-like performance, but with a cleaner burning fuel. Provides the power, torque, and efficiency of a compression-ignition engine WITHOUT the use of efficiency-losing spark plugs.

During the June 27, 2017 Joint Agency workshop on renewable gas, three major hurdles for renewable gas were highlighted in the morning sessions, each of which can be addressed by converting renewable gas to DME:
1. The Need to Increase RNG Market Demand. Because RNG, biogas and biomethane can be converted to DME, DME offers the opportunity to introduce renewable gas to the heavy-duty transportation market. Approximately 90% of the heavy-duty transportation market is comprised of compression-ignition engines due to their performance requirements and the need for power, torque and efficiency. RNG is not a compression-ignition engine fuel and requires efficiency-reducing spark plugs or piloting with diesel.
2. The Difficulty and Expense of Connecting to the Pipeline. Instead of pushing through the high-cost, time-consuming process of connecting to the pipeline, the time, efforts and funds should be invested in processing the renewable gas to DME. This alternative processing results in a true compression-ignition fuel that operates in a truck with diesel-like costs, maintenance, and performance and requires low-cost fueling infrastructure (compared to CNG infrastructure).
3. Public Relations. DME does not have the same negative public relations issue as RNG, which is linked to natural gas storage issues at Aliso Canyon and other challenges. The public is largely unaware of DME, which presents the opportunity to educate them on it and its environmental, cost and performance benefits as a transportation fuel.

As California evaluates its strategy for addressing its SLCP challenges, several suggested conclusions:
â€¢ DME is a form of renewable gas and should be included in its definition.
â€¢ DME is the first carbon-negative, compression-ignition fuel.
â€¢ Because DME is a compression-ignition fuel, DME offers a near-term pathway to introducing renewable gas into the heavy-duty transportation market.

As background, Oberon Fuels was founded in 2010 in San Diego, CA and is launching DME in North America as a cleaner alternative to diesel for the truck, agricultural, and construction markets. Using various, domestic feedstocks such as animal waste, food waste, landfill gas, and flare gas, Oberon has developed a small-scale process that cost-effectively converts two greenhouse gases, methane and carbon dioxide, to DME. DME is a clean-burning, non-toxic, potentially renewable fuel that offers diesel-like performance with propane-like handling properties. With a high cetane number (55-60) and quiet combustion, DME is an excellent diesel alternative that will meet strict emissions standards and assist in lowering greenhouse gases (68-101% GHG reduction when made from renewable sources). Oberon Fuelsâ€™ first facility, located in Brawley, California, came online in the Summer of 2013 and produces fuel-grade DME that has been used in demonstrations around the world, including Volvo Trucks (Texas), Mack Trucks (NYC), and Ford (Germany, Canada).

Figure 1. Located in CAâ€™s Imperial Valley Region (Brawley, CA), Oberonâ€™s commercial demonstration facility produces fuel-grade DME used by Volvo, Ford, and Mack Trucks, and Ford passenger cars . It is the first known commercial deployment of this technology in the world and first fuel-grade DME production in North America.

Figure 2. Fueled by Oberon DME, DME vehicle demonstrations are occurring around the world as DME transitions from R&D to commercialization. LEFT. 2013 marked the beginning of Volvoâ€™s first test of a DME-powered, Class 8 truck in North America. These Beaumont, TX-based vehicles hauled molten sulfur around the region. CENTER. In 2015, Ford announced a 3-year project to build the worldâ€™s first DME-powered passenger car for on-road testing in partnership with Oberon, DENSO and various academic institutions. RIGHT. On January 11, 2017, NYC Department of Sanitation (DSNY) became the first Mack customer in the world to test a DME-powered Mack truck. Operating out the Fresh Kills Landfill in Staten Island, DSNY is evaluating DMEâ€™s ability

to meet the challenges of their complex duty cycle while offering significant GHG reductions. (Photos: Ron Jautz Â© 2017)

On the regulatory front, Oberon is working with state and federal agencies to ensure that the proper regulations are in place to support the commercialization of DME as a transportation fuel:
â€¢ California Department of Food and Agriculture (CDFA). Because of the establishment of this ASTM consensus standard, DME is now approved for use as vehicle fuel in the state of California. CDFA filed new regulations to the California Code of Regulations with the Secretary of State, legalizing dimethyl ether for use in vehicles, after the passing of the ASTM Specification for DME as a transportation fuel. This change in the code of regulations was finalized on January 1, 2015.
â€¢ CARB. Oberon is working with CARB to navigate the Multimedia Assessment process. DME Tier 1 Report was posted to CARBâ€™s website on February 13, 2015.
â€¢ ASTM International passed a new standard specification ASTM D7901-14b for â€œDimethyl Ether for Fuel Purposesâ€ initially in February 2014 with two, updated versions passed later in 2014.
â€¢ EPA. Biogas converted to DME by the Oberon process is eligible for both D-3 and D-5 RINs credits under the EPAâ€™s Renewable Fuel Standard. EPA determined that Oberonâ€™s biogas-based DME resulted in 68% reduction in greenhouse gases.

To further development of DME as a renewable gas, Oberon Fuels suggests that the state of California:
â€¢ Fund demonstration projects to validate its production process and use in various vehicles and duty cycles.
â€¢ Provide rebates or tax credits for use of DME and for purchase of vehicles designed to run on DME.
â€¢ Assist in communicating the benefits of DME to potential users and the public.

We fully support the state of Californiaâ€™s efforts in dealing with its Short-Lived Climate Pollultant challenges and look forward to DME being part of the solution. Please feel free to contact us should you have any questions or if we can offer additional support.

All the Best,

Rebecca Boudreaux, Ph.D.
President, Oberon Fuels

Additional submitted attachment is included below.

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2. **The Difficulty and Expense of Connecting to the Pipeline.** Instead of pushing through the high-cost, time-consuming process of connecting to the pipeline, the time, efforts and funds should be invested in processing the renewable gas to DME. This alternative processing results in a true compression-ignition fuel that operates in a truck with diesel-like costs, maintenance, and performance and requires low-cost fueling infrastructure (compared to CNG infrastructure).
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