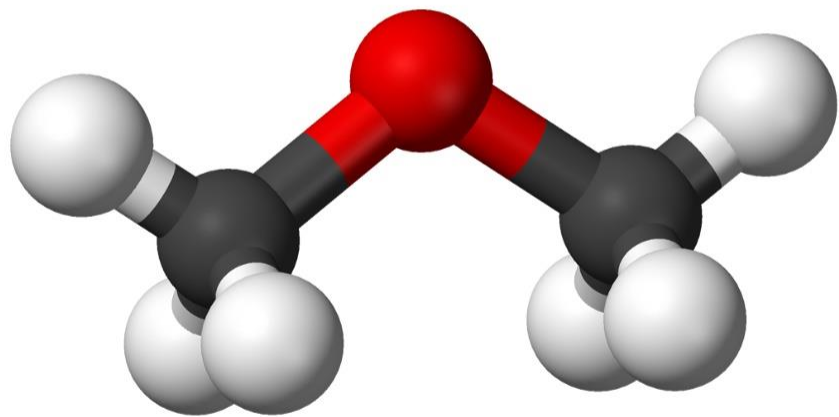


# DME + PROPANE: ACHIEVING CARBON NEUTRALITY

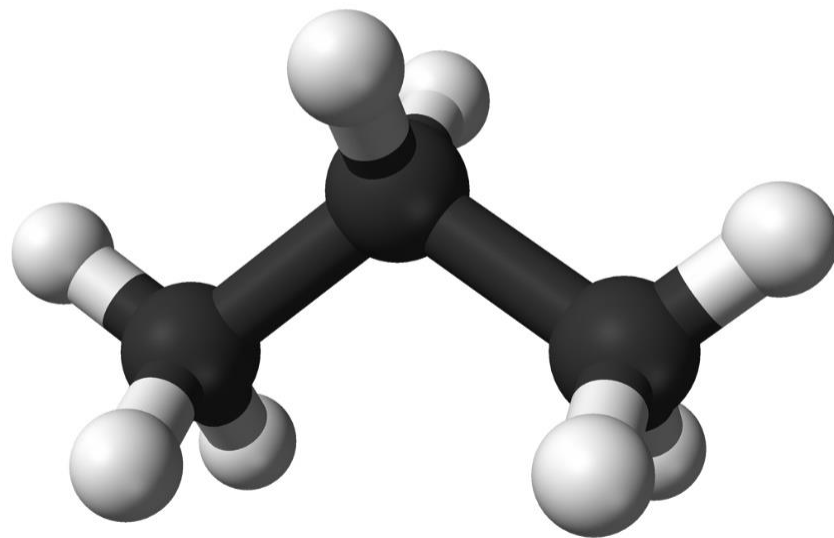
An aerial photograph of an industrial facility, likely a bio-refinery or chemical plant. The central feature is a tall, multi-level structure with a green metal frame and yellow safety railings. Several workers in hard hats and safety gear are positioned on different levels of this structure. To the right of the structure is a large, white, horizontal cylindrical tank with the letters 'DME' printed on its side. In the background, there is a large, rectangular pond filled with a green, algae-like substance. The surrounding area is a mix of dirt, gravel, and paved roads. The overall scene suggests a large-scale industrial operation focused on sustainable or carbon-neutral production.

REBECCA BOUDREAU, PH.D., PRESIDENT & CEO, OBERON FUELS

## **DME:** ADDITIONAL PATHWAY TO INTRODUCING RENEWABLE CONTENT



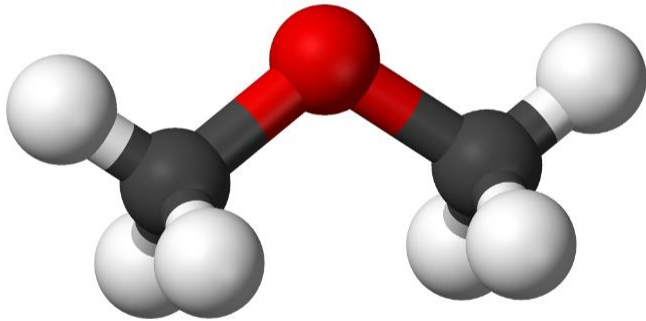
**DIMETHYL ETHER (DME)**



**PROPANE**

## DME: POWER OF THE MOLECULE

---



**DIMETHYL ETHER (DME)** IS A RENEWABLE MOLECULE THAT OFFERS A PATHWAY TO ZERO EMISSIONS AND CARBON NEUTRALITY IN THE TRANSPORTATION SECTOR AND BEYOND.

# DME: ADVANTAGES



## **PATHWAY TO ZERO EMISSION VEHICLES**

DME offers a pathway to zero emission vehicles. DME can be cost-effectively transported and converted to hydrogen at fueling stations.



## **LOCAL FEEDSTOCK. LOCAL PRODUCTION. LOCAL CONSUMPTION.**

Opportunity to use local waste streams to create regional fuel supply. Fuel is consumed in the region its produced.



## **REDUCES METHANE EMISSIONS**

Methane is converted to DME rather than being released into the atmosphere. Eliminates the need for pipeline injection of biomethane.



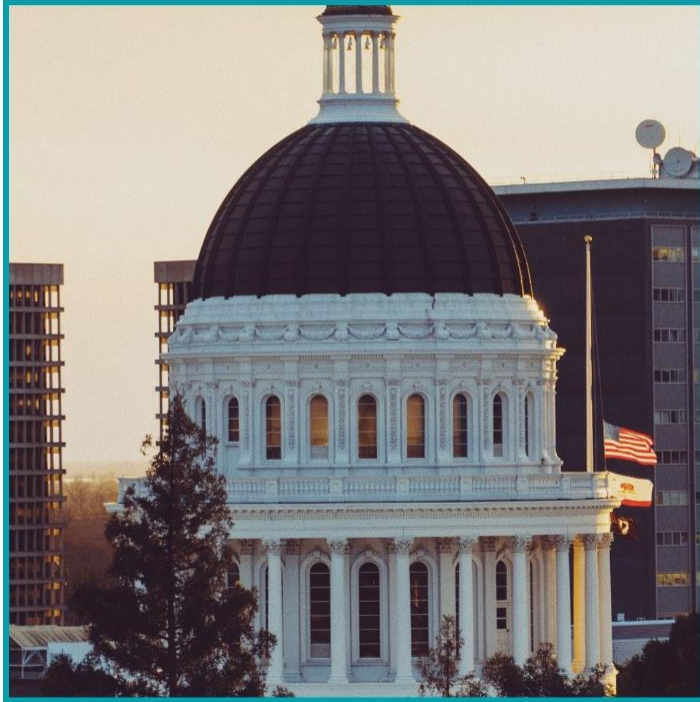
## **68-101% REDUCTION IN GHGS. CI -278.**

When made from dairy manure and food waste, offers significant reductions in GHGs. CARB estimates carbon intensity of DME to be -278. \*EPA, Argonne GREET.



## DME: PART OF THE CLIMATE CHANGE SOLUTION

---



## ON SEPTEMBER 24, 2020, DME LEGISLATION AB 2663 SIGNED BY CA GOV. NEWSOM

1 of 7 bills that were characterized as “legislation that further advances California’s climate leadership and transition away from fossil fuels.”

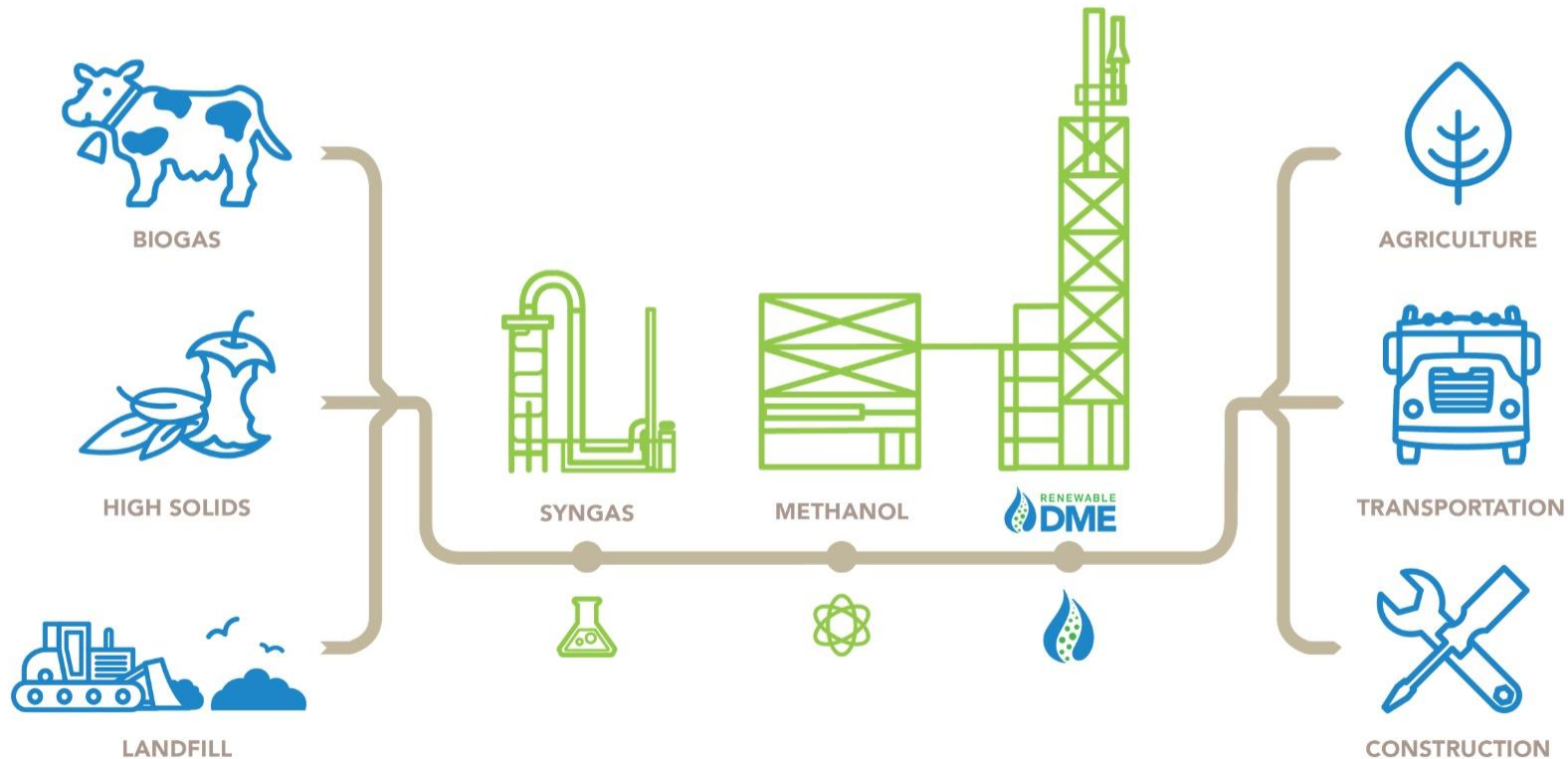
## DME: PART OF THE CLIMATE CHANGE SOLUTION, AB 2663



## REDUCES TAXATION ON DME TO GIVE PARITY WITH OTHER ALTERNATIVE FUELS

CA Sales and Use Tax on DME, whether used as a diesel replacement or blended with propane, is reduced from 18 cents per gallon to 6 cents per gallon, providing parity with propane, CNG, and LNG.

# HOW DO YOU MAKE DME? OBERON'S SMALL-SCALE PROCESS





## **DME PRODUCTION:** OBERON'S PILOT PRODUCTION FACILITY

- **LAST STEP OF OBERON'S 3-STEP PROCESS. PRODUCED 1ST FUEL-GRADE DME IN NORTH AMERICA.**

- **OBERON'S DME PLANT IN SOUTHERN CALIFORNIA**

Located 2 hours east of San Diego in the Imperial Valley region of CA

- **STARTED PRODUCING FUEL-GRADE DME IN 2013**

Fuel-grade DME from Oberon's plant has been used for Volvo, Mack, and Ford DME vehicle demonstrations in Texas, NYC, Germany, and Canada.

- **PERMITTED AND BUILT IN 12 MONTHS**





## DME PRODUCTION: SCALING UP WITH CALIFORNIA SUPPORT

In 2019, CEC awarded Oberon Fuels \$2.9 million to upgrade its existing CA DME production plant (Imperial Valley) from pilot to demonstration scale and produce the 1st renewable DME in the US.





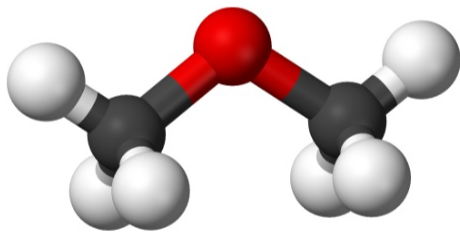
## DME PRODUCTION: SCALING UP WITH CALIFORNIA SUPPORT

---

In Summer 2020, Oberon's operations team expanded to include 9 additional operators. In November 2020, Oberon broke ground on plant modifications. DME Production started Feb. 2021.



# 1 MOLECULE = 3 MARKETS



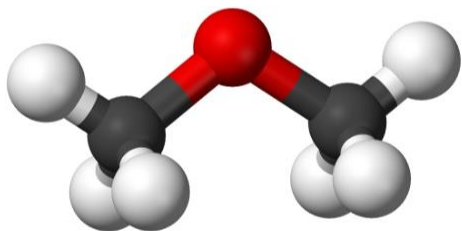
**DME/PROPANE  
BLENDING**

**DME AS A DIESEL  
REPLACEMENT**

**DME AS A  
HYDROGEN  
CARRIER**



# 1 MOLECULE = 3 MARKETS



**DME/PROPANE  
BLENDING**

Blending DME into propane for use as a transportation fuel to drastically reduce its carbon intensity.

**DME AS A DIESEL  
REPLACEMENT**

**DME AS A  
HYDROGEN  
CARRIER**

## **DME MARKETS: DME/PROPANE BLENDING**

---

- **DME OFFERS A SCALABLE WAY TO REDUCE THE CARBON INTENSITY OF PROPANE AS A TRANSPORTATION FUEL.**
- **IN THE STATE OF CALIFORNIA ALONE, OVER 6,000 - 7,000 VEHICLES (25 MILLION GALLONS PROPANE) AND 49,000 FORKLIFTS (40 MILLION GALLONS PROPANE) RUN ON PROPANE.**
- **CARB AMENDED CA'S LOW CARBON FUEL STANDARD (LCFS), REQUIRING A 20% REDUCTION IN CARBON INTENSITY (CI) OF THE STATE'S FUEL SUPPLY BY 2030.**



## DME MARKETS: DME/PROPANE BLENDING

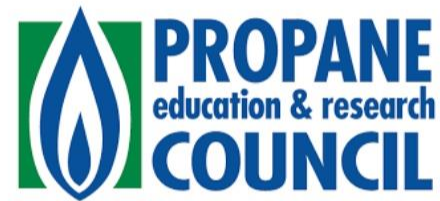


- WITH CI OF 83, PROPANE USED IN TRANSPORTATION APPLICATIONS WILL EXCEED THE ALLOWABLE CI AND GENERATE DEFICITS BEFORE 2030.
- CARB CALCULATED DME MADE FROM DAIRY BIOGAS (CI -150) BY THE OBERON PROCESS TO HAVE A CI VALUE OF -278.
- WHILE TESTING WILL DETERMINE THE IDEAL BLENDING RATIO FOR PERFORMANCE AND HANDLING PURPOSES, SMALL AMOUNTS OF CARBON-NEGATIVE DME CAN SIGNIFICANTLY REDUCE THE CI OF THE BLENDED FUEL.



## DME MARKETS: DME/PROPANE BLENDING

---



# DME: OPPORTUNITIES FOR THE PROPANE INDUSTRY



- **BLENDING WITH TRADITIONAL AND RENEWABLE PROPANE TO GET CARBON INTENSITY REDUCTIONS**

Initially in the transportation sector due to current incentive structure but can be used across numerous sectors

- **LEVERAGING PROPANE'S EXISTING INFRASTRUCTURE: 1 MOLECULE = 3 MARKETS**

Existing propane infrastructure used to storage, transport, and dispense propane can be used with no or little modifications for DME, creating new market opportunities

# WHAT IS NEEDED TO MOVE THE INDUSTRY FORWARD?

---

## **1 ENCOURAGE INNOVATIVE APPROACHES TO ACHIEVING ENVIRONMENTAL GOALS**

Implement technology-neutral policies that encourage innovative solutions.

## **2 STATE-BY-STATE ADOPTION OF LCFS PROGRAMS**

Local Feedstock. Local Production. Local Consumption.



# REBECCA BOUDREAUX, PH.D., PRESIDENT & CEO

Oberon Fuels, 2159 India Street, San Diego, CA  
92101

+1-619-255-9361

@Oberonfuels

rebecca@oberonfuels.com

www.oberonfuels.com

