USING BIO-PROPANE DME AS A VIABLE, RENEWABLE, TRANSPORTATION FUEL IN CALIFORNIA

2011-2012 Advisory Committee Meeting for the
Alternative and Renewable Fuel and Vehicle Technology Program

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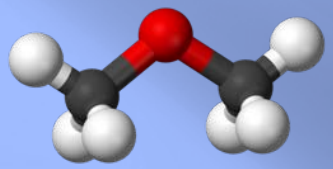
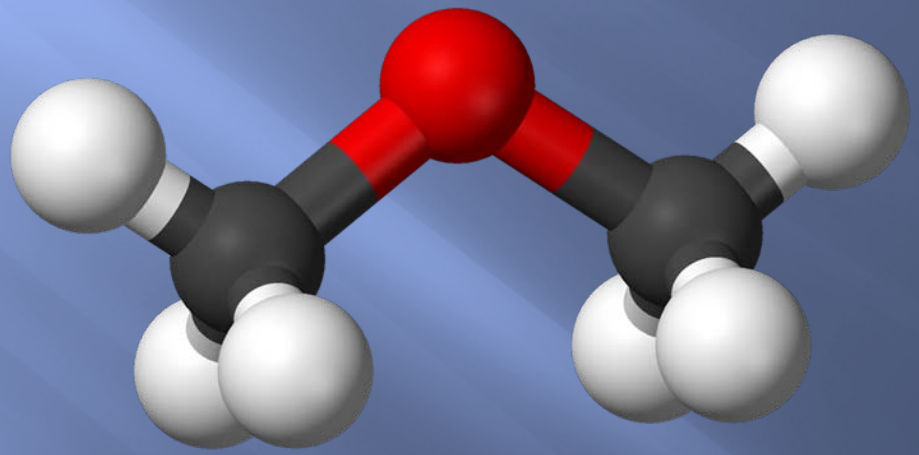


What Is DME?

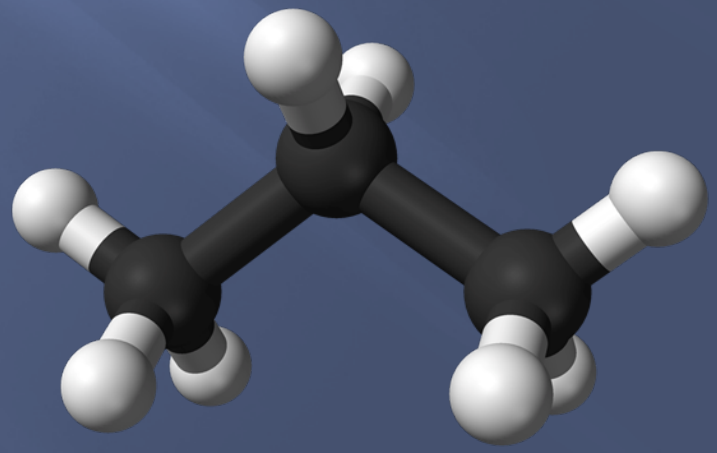
- Historically used as aerosol propellant
- Normally made from methanol
  - Primary feedstock: natural gas
  - Alternative feedstock: coal or biomass
- Burns like natural gas or propane
- Handles like LPG (propane/butane)
- Ideal for emerging alternative fuel market
  - LPG blend or substitute
  - Outstanding diesel alternative fuel
    - Transportation and power generation

DME Is a Premier Biofuel

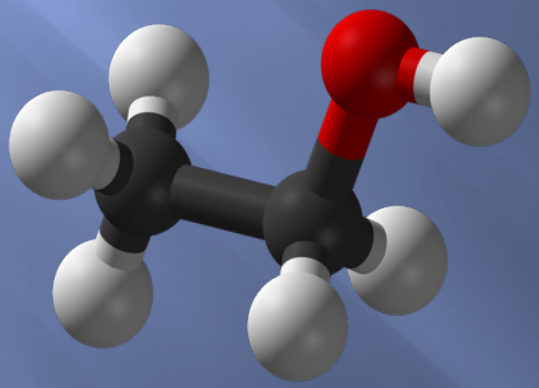
- DME = Dimethyl Ether (Wood Ether) - C2H6O



Propane (LPG)



Ethanol



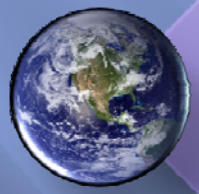
DME is Clean & Green

Health

- Approved as consumer product propellant
- No human hazard relative to toxicity or carcinogenicity within exposure limits

Safety

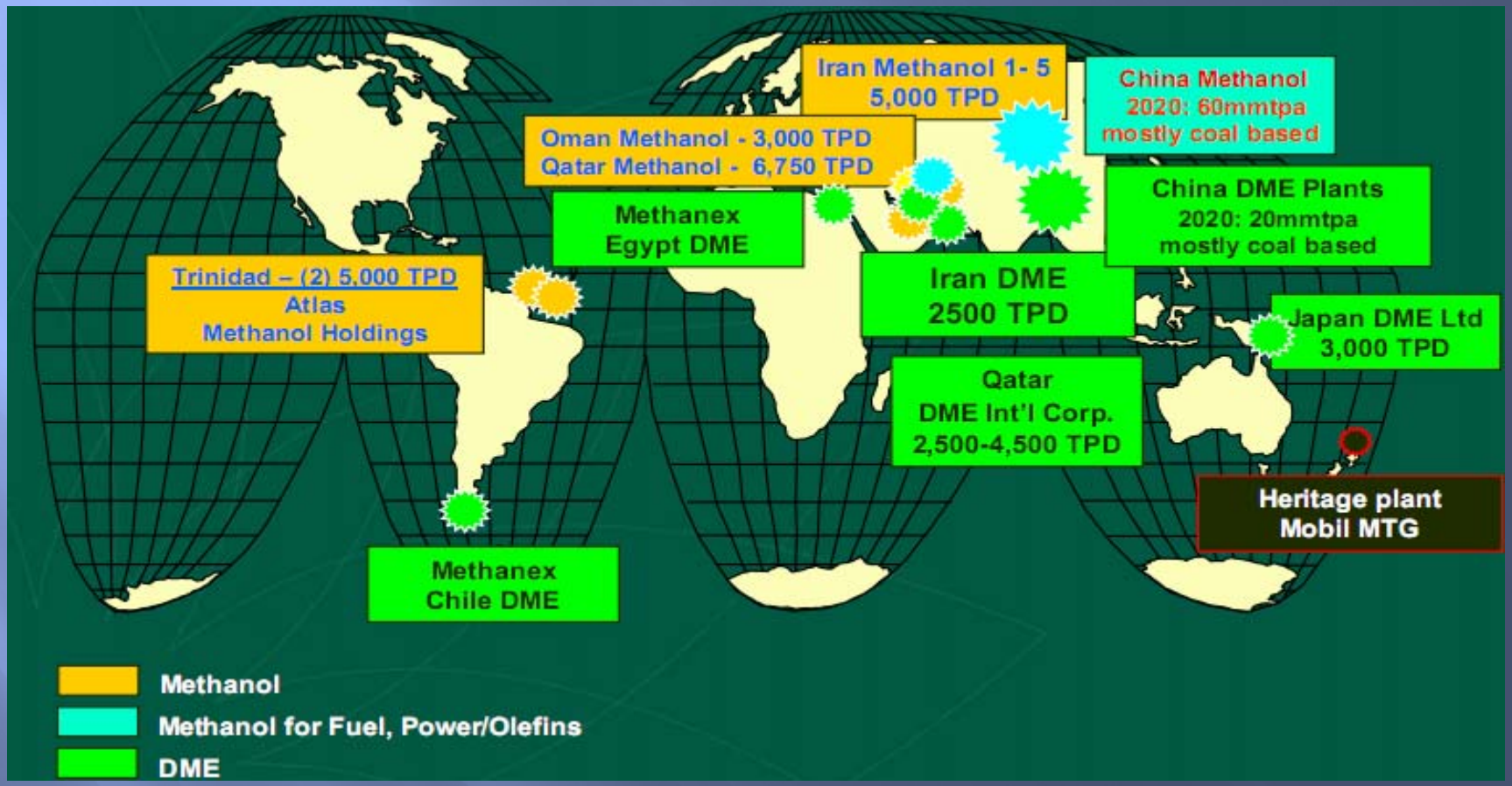
- Flammable liquid like LPG
- Thermally stable
- Similar safety guidelines and codes as LPG



Environment

- No particulates/soot emissions
- No sulfur emissions
- Very low NOx and CO
- Does not deplete ozone
- Decomposes within hours if released
- Can be renewable biomass-based

DME Transitioning from Chemicals To Fuels



- North America has not been a market leader

DME as Ultimate Diesel Fuel

- Alternative to diesel – not a blend
- Excellent performance in diesel engines
  - Higher cetane rating than conventional diesel
  - Equal or better fuel efficiency than conventional diesel
  - Requires modification only to fuel tank, pump & injectors – no changes to engine proper
- Substantially cleaner than conventional diesel
  - No smoke
  - Greatly reduced particulates!
  - Very low NOx and CO
  - Simplified aftertreatment

- *Reduces GHG by 95% compared to diesel when produced from biomass!*

Growing Level of Support

- NYSERDA provided a $50,000 grant to develop a DME vehicle demonstration program at University of Buffalo.
  - AFTC, UB, Penn State, Volvo and GTI are also involved.
- CALSTART investigating a similar DME vehicle demo program at the Ports of Long Beach and Los Angeles Basin.
- CleanFuel USA recognizes DME "as the future of Propane" and is providing support for a propane: DME blended vehicle demonstration program.
- Propane Education & Research Council (PERC) interested in providing funding for propane: DME blend testing.
- Haldor Topsoe providing letter supporting programs.

What is Driving Interest?

- Air Quality and Climate Change Concerns
- California (particularly efforts at Ports of Long Beach/LA and LA Basin) - urban air quality
- New York State - greenhouse gas mitigation
- Private Sector desire to use fuels that are more environmentally friendly for brand image and corporate responsibility
- Market expansion for propane vehicles
- Revitalization of the forestry industry and wood waste management
- Rural Industrial Diversification

The Propane Opportunity

- Propane has affordable domestic fuel, emissions & CO2 benefits over traditional fuels today
- But lacks the “appeal” of a sustainable fuel of the future
- Bio-DME blending is another opportunity to increase use of propane as transportation fuel in CA
- Viable option to significantly reduce CO2 in CA
- Propane infrastructure already in place for distributing DME as a “drop-in” renewable fuel.

Pathways to Success

- DME meets all technical requirements as a “Advanced Biofuel” under RFS2 and as a “drop-in” renewable fuel due to existing propane distribution infrastructure
- Discussion & application to EPA for RFS2 RIN in process
- DME qualifies for financial support under California Climate Change Legislation (AB 32) due to its inclusion in AB 118 as an approved Alternative Fuel
- Key industrial and propane players are interested in the development of CA DME market
- DME-fueled vehicles on the road in China and Sweden, as well as DME vehicle development activities in Japan and Germany
- DME more economically competitive than other renewable fuels

Next Steps

- WLPGA & propane industry to work with CEC to develop new programs for DME initiation
- Initiate CA DME vehicle demonstration programs with propane:DME blended vehicles as first priority
- Identify and source a “neat” DME vehicle for CA demonstration
- IDA, PERC and NPGA work with EPA & DOE on DME as an “drop-in” Advanced Biofuel under RFS2
- Obtain funding for expanding these programs through additional industry and government participation
- Consider possible opportunities for first bio-DME production plant in CA

BioDME Summary

- Lowest environmental impact of any biofuel
- Can rely 100% on local biomass
- Economically competitive against conventional fuels
- Technology is commercially ready
- Potential market is very large
- Biggest challenge will be introduction into market – LPG first, diesel-transport later
- Partnerships with agencies & related industries essential
  - Energy agencies, diesel mfg's, truck & bus fleets