

INFORMATIONAL SECTION: Technology Fundamentals for Vehicles & Charging Infrastructure

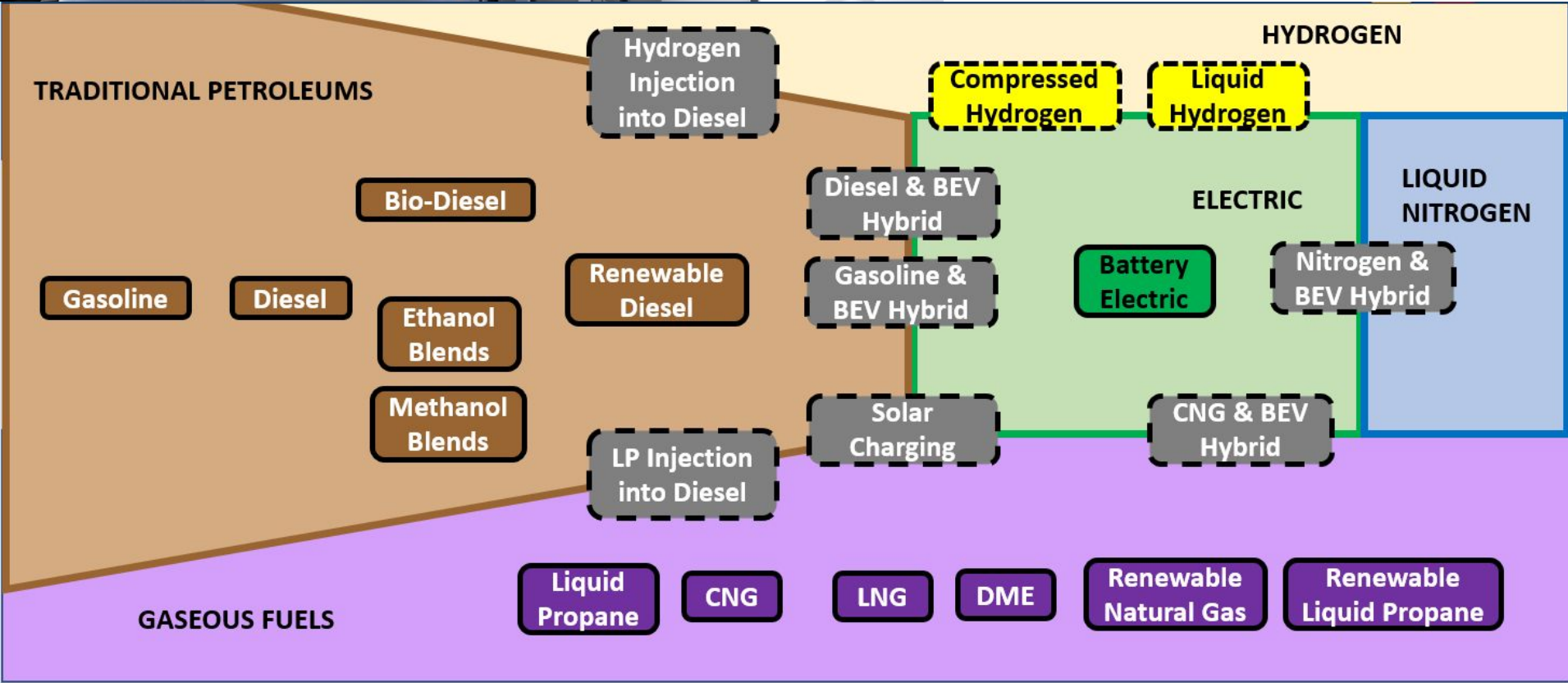


Dave Schaller
Industry Engagement Director
NACFE

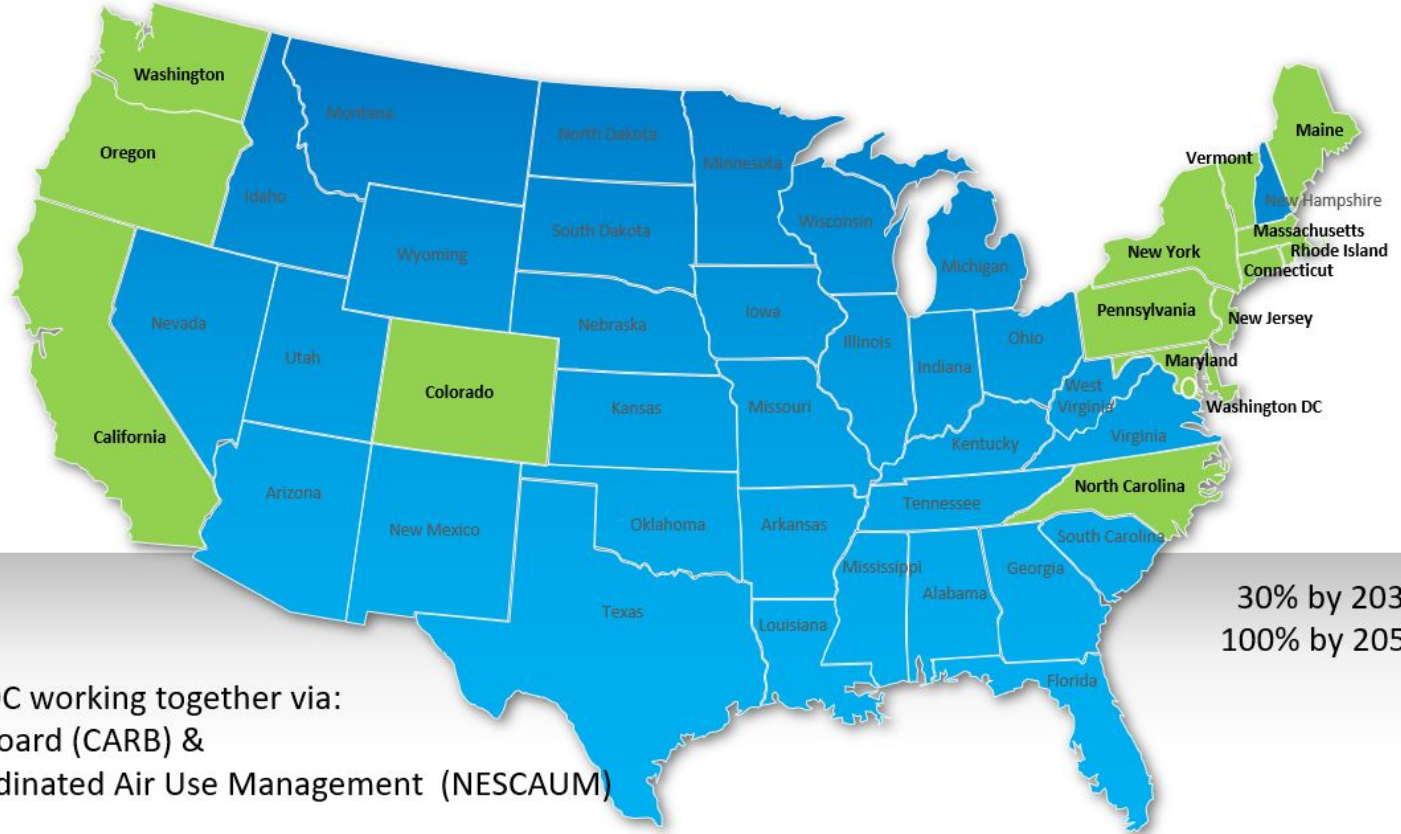


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Alternative Fuels for MD/HD Trucks



Movement Towards EV Trucks



30% by 2030
100% by 2050

15 States & Washington DC working together via:
California Air Resources Board (CARB) &
Northeast States for Coordinated Air Use Management (NESCAUM)

Memorandum Of Understanding signed July 14th, 2020

Change Is In The Air



Announcements

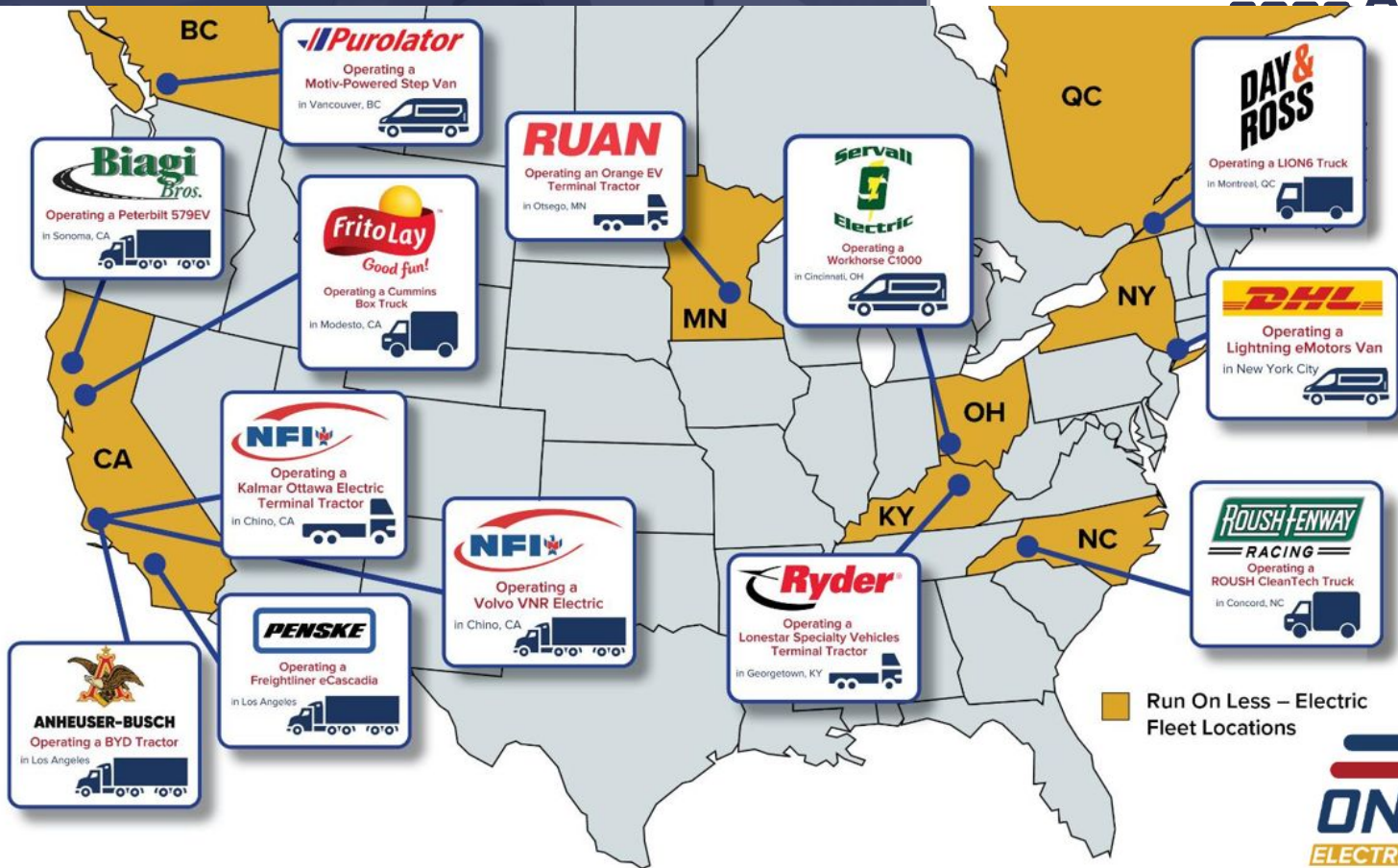
- E-commerce (Amazon/Rivian, UPS/Arrival, FedEx, DHL...)
- Rivian assembly plant in Bloomington, IL
- Lion Electric building assembly plant in Joliet, IL
- Sustainability Reports from major fleets: Schneider, U.S. Xpress and others



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EV Truck Fleet Demonstration



Free Information



RunOnLess.com provides:

1. Fleet Introduction Videos (Drivers, Leadership, OEMs, & trucks)
2. Daily “Stories from the Road” Videos on EV trucking issues
3. Fleet Profile (information on the fleet, truck, charging system & duty cycle)
4. Daily Metrics
5. EV Truck Bootcamp (10 sessions with 48 experts sharing their insights)



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OEMs: Incumbents & New Entries



The screenshot shows the 'ZERO-EMISSION TECHNOLOGY INVENTORY' tool. At the top, there are navigation links: HOME, ABOUT, NEWS, EVENTS, RESOURCES, CALSTART, and CONTACT. Below the title, there are logos for 'GLOBAL COMMERCIAL VEHICLE DRIVE TO ZERO' and 'A PROGRAM OF CALSTART'. The main interface is divided into three sections: 'SELECT A VEHICLE PLATFORM TO EXPLORE', 'SELECT A REGION', and 'SELECT A VEHICLE MANUFACTURER'. The 'SELECT A VEHICLE PLATFORM TO EXPLORE' section features ten circular icons representing different vehicle types: Transit Bus, School Bus, Shuttle Bus, Cargo Van, Yard Tractor, MD Truck, MD Step Van, HD Truck, and Other. The 'SELECT A REGION' section shows a world map with North America highlighted in blue. The 'SELECT A VEHICLE MANUFACTURER' section displays a grid of logos for various OEMs, including ALSTOM, BYD, FUSO, HYUNDAI, and many others. At the bottom left, there is a timeline titled 'REPORTED VEHICLE AVAILABILITY THROUGH 2023' with markers for Available, 2020, 2021, 2022, and 2023. A 'RESET FILTERS' button is located at the bottom left corner.

- “ZETI”
- Calstart on-line tool
- Part of *Drive to Zero* program at Calstart
- Launched March 2020
- Current & future production models
- Links to OEM web pages

<https://globaldrivetozero.org/resources/zero-emission-technology-inventory/>

Fleet Cost Structure



TCO: Total Cost of Ownership (Battery Electric vs Internal Combustion Engines)

- **Purchase Price** (Going Up by a factor of 2 or 3)
- **Residual Value** (Completely unknown: no current basis of experience)
- **Operations** (Electricity and TOU vs diesel or other fuel)
- **Maintenance** (Expecting significant savings but yet to be proven)
- **Infrastructure**
- **Fuel tax** (eliminated, at least for now)



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Infrastructure

Challenges Ahead

- Fleets are generally NOT used to working with utilities
- Utilities are generally NOT used to working with fleets
- Fleets & EVSE Charging system suppliers are unknowns to each other



CCS1



CCS2



CHAdeMO

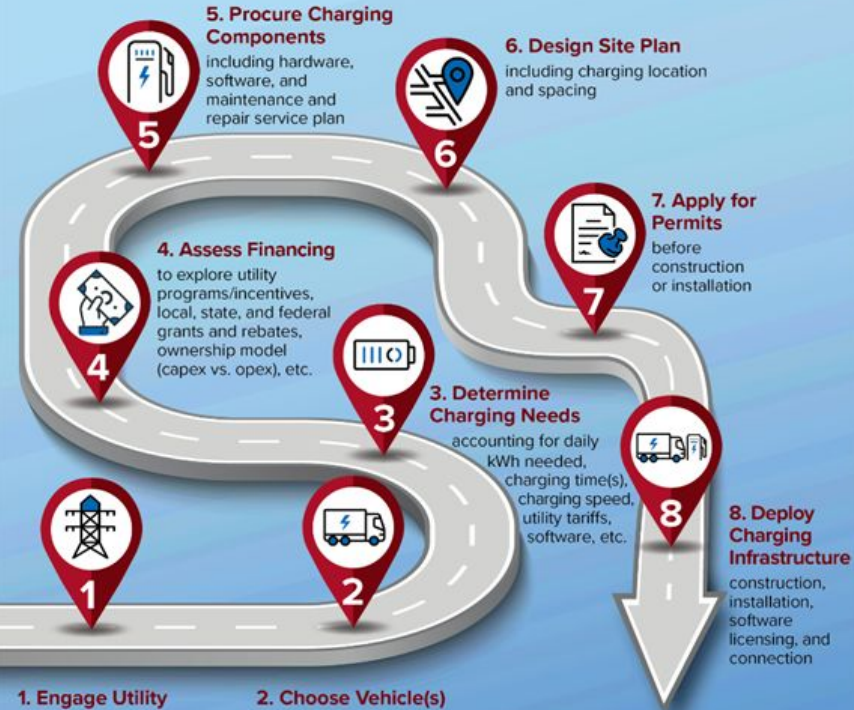


J1772



MCS or CharIN

Charging Procurement Roadmap



1. Engage Utility
to evaluate existing infrastructure, programs, case studies, etc.

2. Choose Vehicle(s)
and consider duty cycle, range, dwell time, battery capacity, charge port, etc.

